HI50a Functions and Graphs 1

Time : to : Date Name

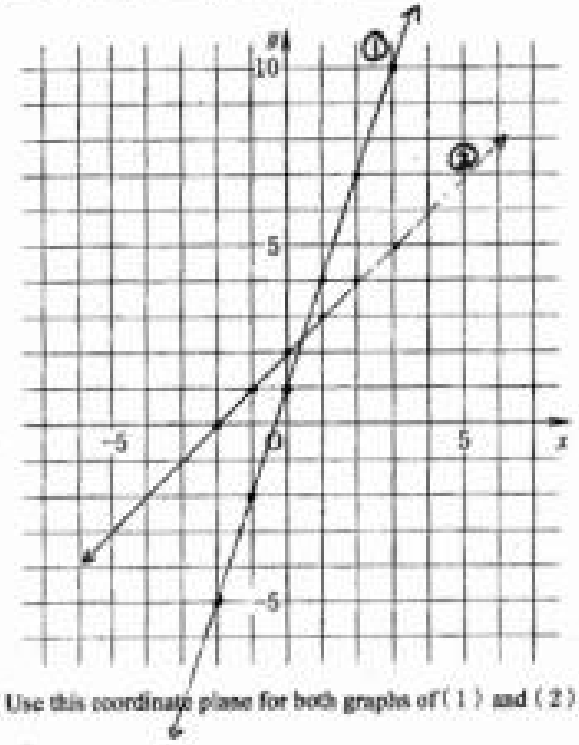
◆ Complete the chart and graph the equation.

(1) $y=3x+1$

x	−2	−1	0	1	2	3
y	−5	−2	1	4	7	10

(2) $y=x+2$

x	−2	−1	0	1	2	3
y	0	1	2	3	4	5



(Use this coordinate plane for both graphs of (1) and (2).)

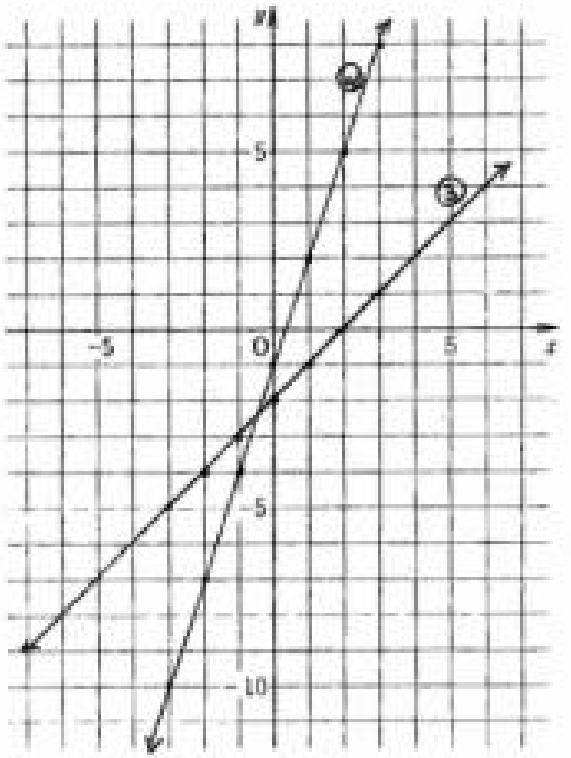
HI50b

(3) $y=x-2$

x	−3	−2	−1	0	1	2	3
y	−5	−4	−3	−2	−1	0	1

(4) $y=3x-1$

x	−3	−2	−1	0	1	2	3
y	−10	−7	−4	−1	2	5	8



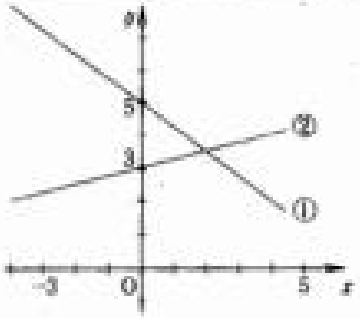
(Use this coordinate plane for both graphs of (3) and (4).)

H151a Functions and Graphs 2

Time : to : Date Name

Ⅰ Graph the equation to find the y-intercept of a line based on the definition below.

Definition The *y-intercept* of a line is the y-coordinate of the point where the line intersects the y-axis. For example, the y-intercept of line ① is 5, and the y-intercept of line ② is 3.



(1) The y-intercept of $y = 3x + 1$ is $\boxed{1}$.

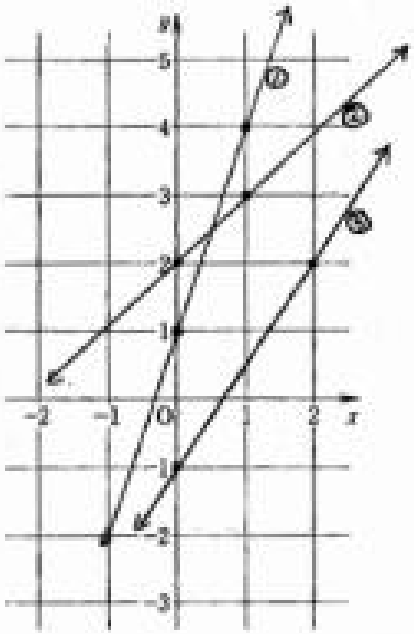
x	y
0	1
1	4

(2) The y-intercept of $y = x + 2$ is $\boxed{2}$.

x	y
0	2
1	3

(3) The y-intercept of $y = \frac{3}{2}x - 1$ is $\boxed{-1}$.

x	y
0	-1
2	2



H151b

Ⅰ State the y-intercept of the line whose equation is given as shown in the examples, and then graph the equation.

Ex. The y-intercept of $y = 2x + 3$ is 3.
The y-intercept of $y = x - 5$ is -5.

(1) The y-intercept of $y = x + 2$ is $\boxed{2}$.

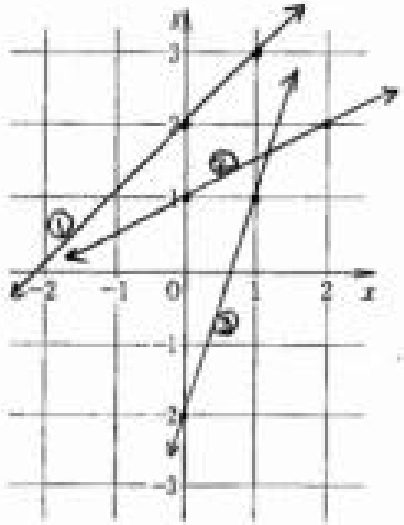
x	y
0	2
1	3

(2) The y-intercept of $y = \frac{1}{2}x + 1$ is $\boxed{1}$.

x	y
0	1
2	2

(3) The y-intercept of $y = 3x - 2$ is $\boxed{-2}$.

x	y
0	-2
1	1



Ⅱ State the y-intercept of the line whose equation is given.

(1) The y-intercept of $y = \frac{1}{7}x + \frac{3}{5}$ is $\boxed{\frac{3}{5}}$.

(2) The y-intercept of $y = \frac{3}{4}x - 2$ is $\boxed{-2}$.

(3) The y-intercept of $y = \frac{2}{5}x - 1$ is $\boxed{-1}$.

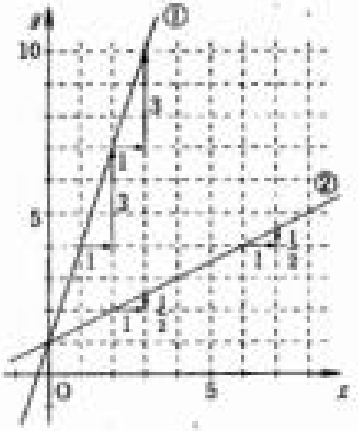
HI52a Functions and Graphs 2

Time : to : Date Name

I Graph the equation to find the slope of a line based on the definition below.

Definition

The *slope* of a line is expressed by the ratio $\frac{rise}{run}$ which shows the steepness of the line.
For example, the slope of line ① is 3 because the line rises 3 units for every unit that it runs horizontally.
The slope of line ② is $\frac{1}{2}$ because the line rises $\frac{1}{2}$ unit for every unit that it runs horizontally.



(1) The slope of $y = 2x$ is 2.

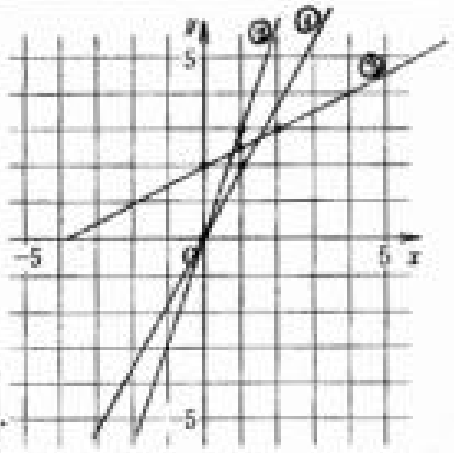
x	0	1
y	0	2

(2) The slope of $y = 3x$ is 3.

x	0	1
y	0	3

(3) The slope of $y = \frac{1}{2}x + 2$ is $\frac{1}{2}$.

x	0	1	2
y	2	$\frac{5}{2}$	3



HI52b

I State the slope of the line whose equation is given as shown in the example, and then graph the equation.

Ex. The slope of $y = 3x + 2$ is 3.

(1) The slope of $y = 3x + 1$ is 3.

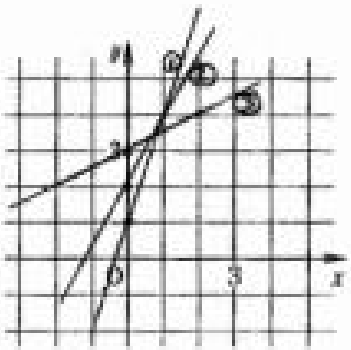
x	y
0	1
1	4

(2) The slope of $y = 2x + 2$ is 2.

x	y
0	2
1	4

(3) The slope of $y = \frac{1}{2}x + 3$ is $\frac{1}{2}$.

x	y
0	3
2	4



II State the slope of the line whose equation is given.

(1) The slope of $y = \frac{3}{5}x$ is $\frac{3}{5}$.

(2) The slope of $y = 4x + \frac{1}{3}$ is 4.

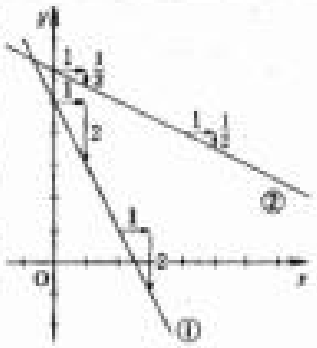
(3) The slope of $y = \frac{2}{3}x - 5$ is $\frac{2}{3}$.

HI53a Functions and Graphs 2

Time : to : Date Name

□I Graph the equation to find the slope of a line based on the definition below.

Definition Lines ① and ② have *negative slopes*. The slope of line ① is -2 because the line falls 2 units for every unit that it runs horizontally. The slope of line ② is $-\frac{1}{2}$ because the line falls $\frac{1}{2}$ unit for every unit that it runs horizontally.



(1) The slope of $y=-2x$ is $\boxed{-2}$.

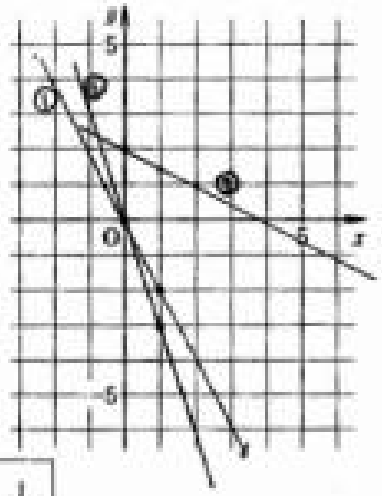
x	0	1
y	0	−2

(2) The slope of $y=-3x$ is $\boxed{-3}$.

x	0	1
y	0	−3

(3) The slope of $y=-\frac{1}{2}x+2$ is $\boxed{-\frac{1}{2}}$.

x	0	1	2
y	2	$\frac{3}{2}$	1



HI53b

□I State the slope of the line whose equation is given as shown in the example, and then graph the equation.

Ex. The slope of $y=-3x+2$ is -3.

(1) The slope of $y=-3x+1$ is $\boxed{-3}$.

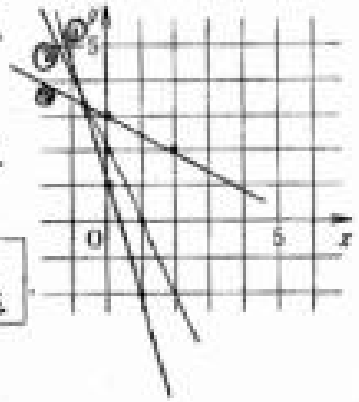
x	y
0	1
1	−2

(2) The slope of $y=-2x+2$ is $\boxed{-2}$.

x	y
0	2
1	0

(3) The slope of $y=-\frac{1}{2}x+3$ is $\boxed{-\frac{1}{2}}$.

x	y
0	3
2	2



□II State the slope of the line whose equation is given.

(1) The slope of $y=-\frac{3}{5}x$ is $\boxed{-\frac{3}{5}}$.

(2) The slope of $y=-4x+\frac{1}{3}$ is $\boxed{-4}$.

(3) The slope of $y=-\frac{2}{3}x-5$ is $\boxed{-\frac{2}{3}}$.

(4) The slope of $y=\frac{2}{3}x-5$ is $\boxed{\frac{2}{3}}$.

H154a Functions and Graphs 2

Time : to : Date Name

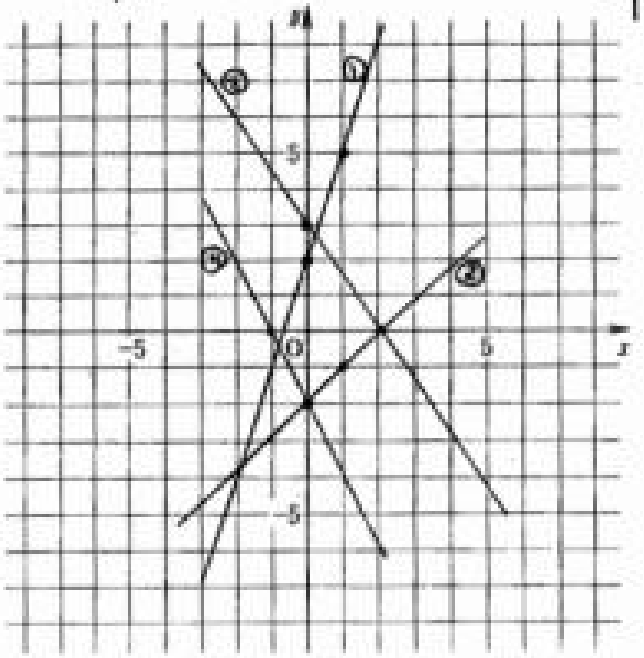
Ⅱ Graph the equation to find the slope and y-intercept of the line.

(1) $y=3x+2$ | x | y | 0 | 2 | 1 | 5 |

(2) $y=x-2$ | x | y | 0 | -2 | 1 | -1 |

(3) $y=-\frac{3}{2}x+3$ | x | y | 0 | 3 | 2 | 0 |

(4) $y=-2x-2$ | x | y | 0 | -2 | -1 | 0 |



(1) Slope 3, y-intercept 2

(2) Slope 1, y-intercept −2

(3) Slope $-\frac{3}{2}$, y-intercept 3

(4) Slope −2, y-intercept −2

H154b

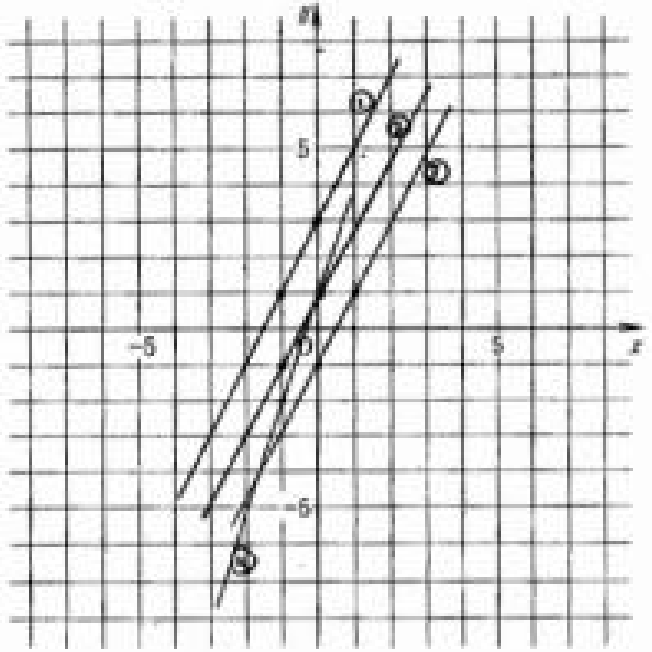
Ⅱ Graph the equation to find the slope and y-intercept of the line.

(1) $y=2x+3$ | x | y | 0 | 3 | -1 | 1 |

(2) $y=2x+1$ | x | y | 0 | 1 | -1 | -1 |

(3) $y=2x-1$ | x | y | 0 | -1 | 1 | 1 |

(4) $y=3x+1$ | x | y | 0 | 1 | -1 | -2 |



(1) Slope 2, y-intercept 3

(2) Slope 2, y-intercept 1

(3) Slope 2, y-intercept −1

(4) Slope 3, y-intercept 1

HI55a Functions and Graphs 2

Time : to : Date Name

I State the slope and y-intercept of the line whose equation is given.

(1) $y = 3x + 1$

Slope 3, y-intercept 1

(2) $y = x - 5$

Slope 1, y-intercept -5

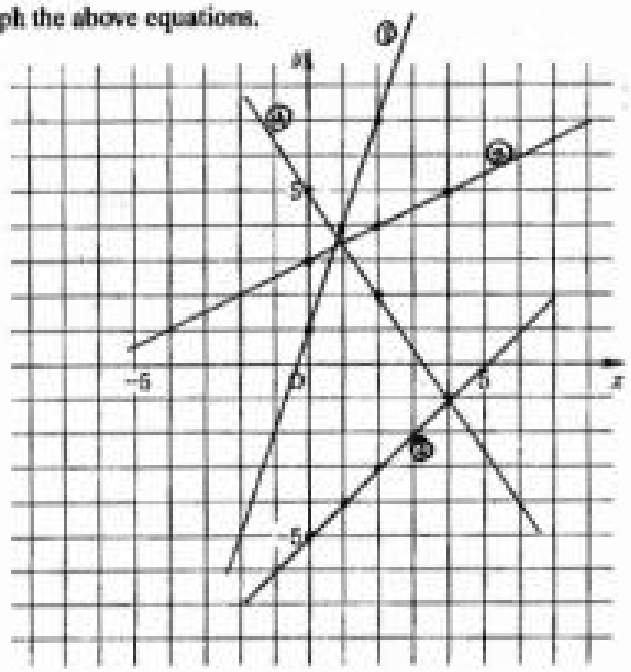
(3) $y = \frac{1}{2}x + 3$

Slope $\frac{1}{2}$, y-intercept 3

(4) $y = -\frac{3}{2}x + 5$

Slope $-\frac{3}{2}$, y-intercept 5

II Graph the above equations.



HI55b

II State the slope and y-intercept of the line whose equation is given.

(1) $y = x + 3$

Slope 1, y-intercept 3

(2) $y = x - 3$

Slope 1, y-intercept -3

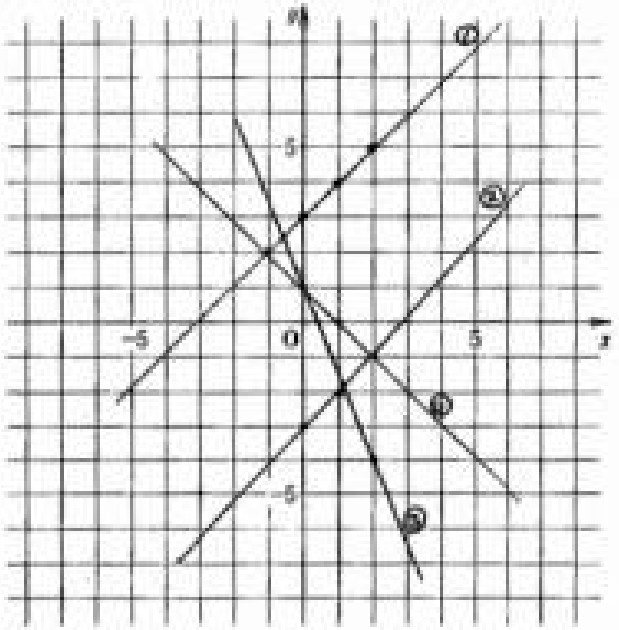
(3) $y = -\frac{5}{2}x + 1$

Slope $-\frac{5}{2}$, y-intercept 1

(4) $y = -x + 1$

Slope -1, y-intercept 1

IV Graph the above equations.



H156a Functions and Graphs 2

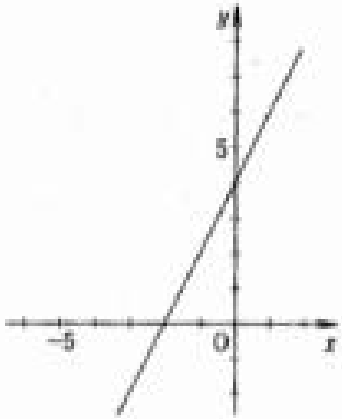
Time : to : Date Name

I Look at the line and write the numerical value in the box.

(1) When the value of x is 0, the value of y is [4].

(2) When the value of y is 0, the value of x is [−2].

(3) When x varies from -2 to 0, y varies from [0] to [4].



(4) When the value of x increases by 1, the value of y increases by [2].

(5) The slope of the line is [2]. The y-intercept is [4].

(6) The equation of the line is $y =$ [2]$x +$ [4].

Note If the relation between x and y is expressed as $y = mx + b$, the relation is called a *linear function*.

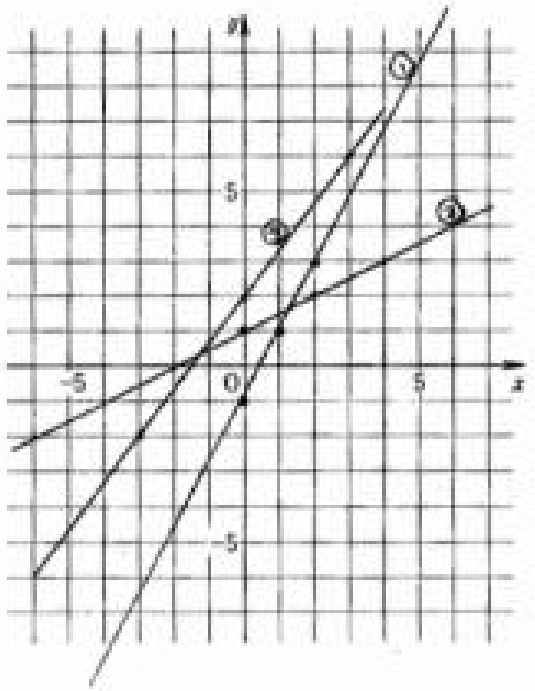
H156b

I Graph each equation by using the numerical values of the slope and y-intercept.

(1) $y = 2x - 1$ $m = 2$, $b = -1$

(2) $y = \frac{1}{2}x + 1$ $m = \frac{1}{2}$, $b = 1$

(3) $y = \frac{4}{3}x + 2$ $m = \frac{4}{3}$, $b = 2$



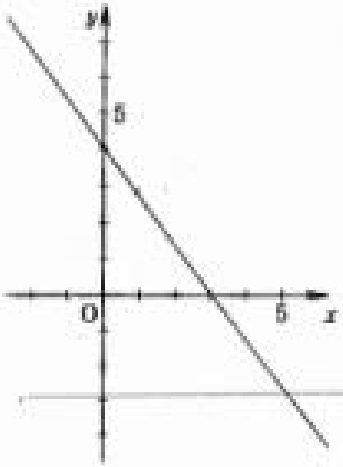
H157a Functions and Graphs 2

Time : to : Date Name

□1 Look at the line and write the numerical value in the box.

(1) When the value of x is 0, the value of y is [4].

(2) When the value of y is 0, the value of x is [3].



(3) When x varies from 0 to 3, y varies from [4] to [0].

(4) When the value of x increases by 1, the value of y decreases by [$\frac{4}{3}$].

$x: 0 \to 1$

$y: 4 \to \frac{8}{3}\left(=2\frac{2}{3}\right)$

(5) The slope of the line is [$-\frac{4}{3}$]. The y-intercept is [4].

(6) The equation of the line is $y =$ [$-\frac{4}{3}$]$x +$ [4].

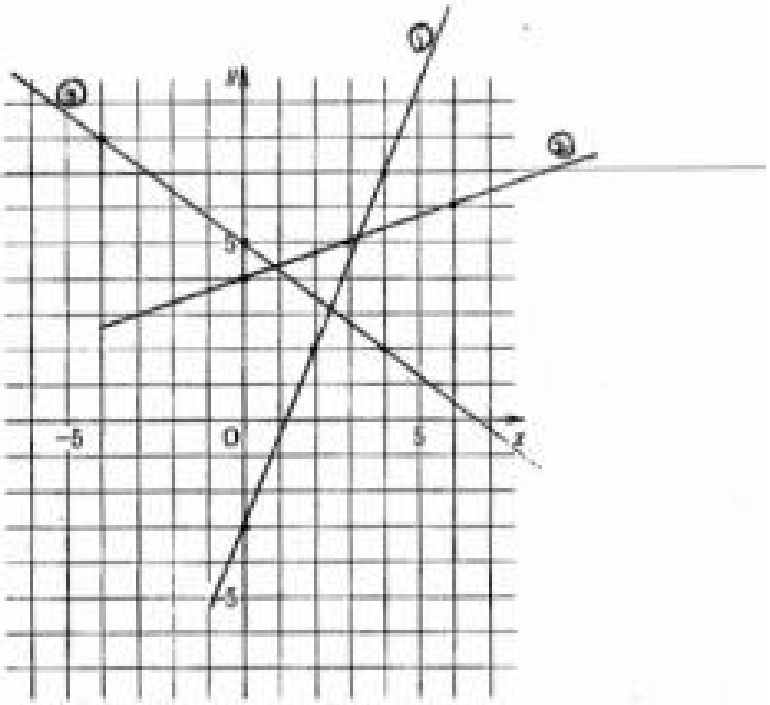
H157b

□1 Graph each equation by using the numerical values of the slope and y-intercept.

(1) $y = \frac{5}{2}x - 3$ $m = \frac{5}{2}$, $b = -3$

(2) $y = \frac{1}{3}x + 4$ $m = \frac{1}{3}$, $b = 4$

(3) $y = -\frac{3}{4}x + 5$ $m = -\frac{3}{4}$, $b = 5$



HI58a Functions and Graphs 2

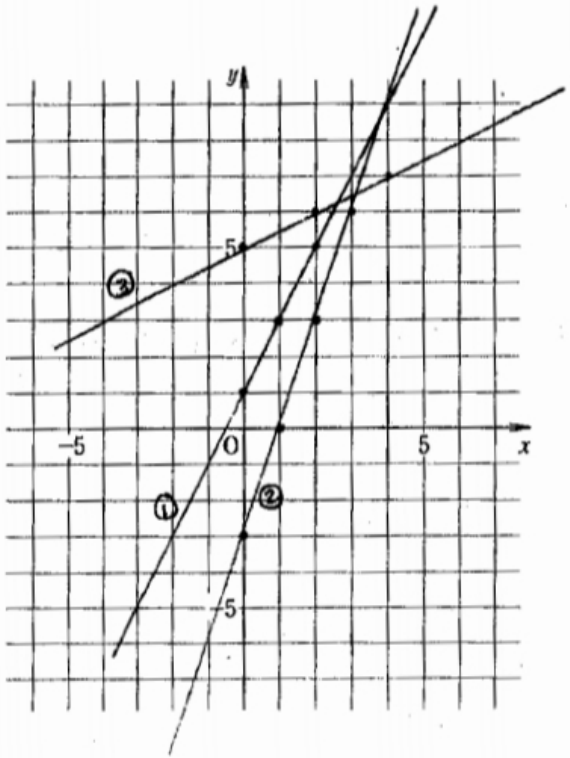
Time : to : Date Name

Graph the following.

(1) Slope 2, y-intercept 1

(2) Slope 3, y-intercept -3

(3) Slope $\frac{1}{2}$, y-intercept 5



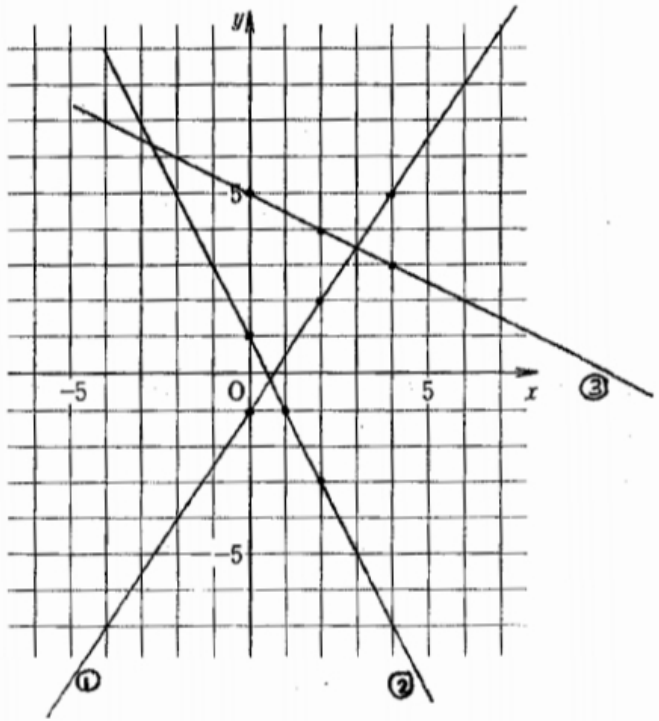
HI58b

Graph the following.

(1) Slope $\frac{3}{2}$, y-intercept -1

(2) Slope -2, y-intercept 1

(3) Slope $-\frac{1}{2}$, y-intercept 5



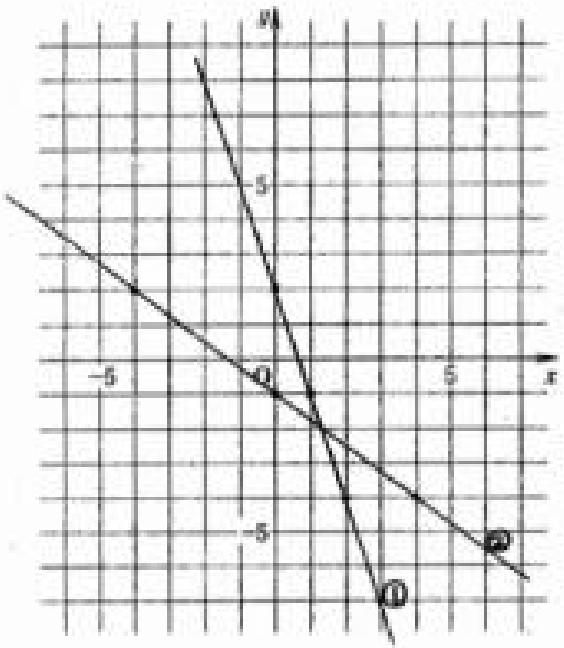
H159a Functions and Graphs 2

Time : to : Date Name

□□ Graph the following and determine the equation of each line.

(1) Slope -3, y-intercept 2

(2) Slope $-\frac{3}{4}$, y-intercept -1



The equation of line (1) is $y = \boxed{-3}x + \boxed{2}$.

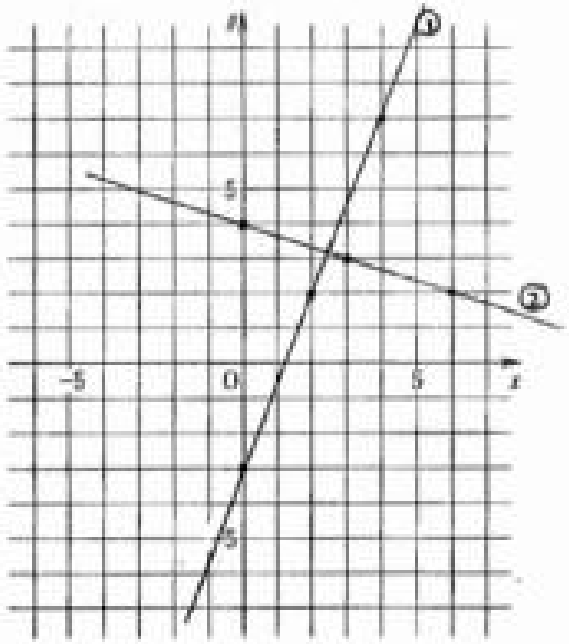
The equation of line (2) is $y = \boxed{-\frac{3}{4}}x - \boxed{1}$.

H159b

□□ Graph the following and determine the equation of each line.

(1) Slope $\frac{5}{2}$, y-intercept -3

(2) Slope $-\frac{1}{3}$, y-intercept 4



The equation of line (1) is $y = \boxed{\frac{5}{2}x - 3}$.

The equation of line (2) is $y = \boxed{-\frac{1}{3}x + 4}$.

H160a Functions and Graphs 2

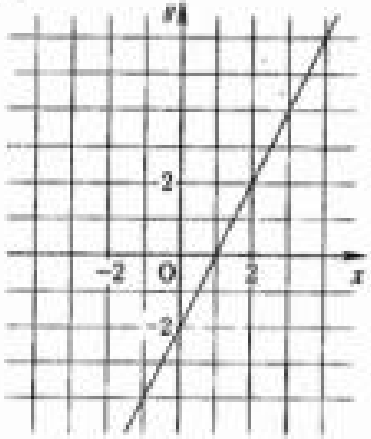
Time : to : Date Name

Ⅰ Determine the equation of the line graphed at the right.

[Sol]

The slope is $\boxed{2}$ and the y-intercept is $\boxed{-2}$.

Therefore the equation of the line is $y = \boxed{2}x - \boxed{2}$.



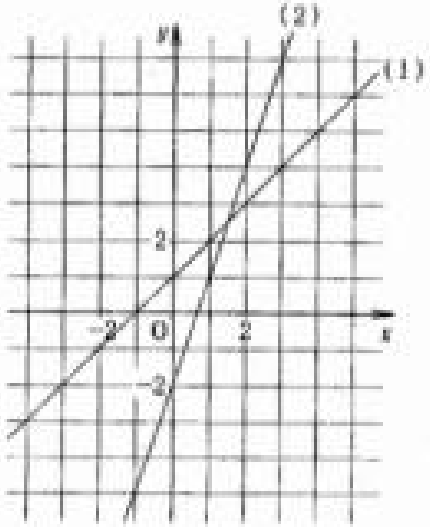
Ⅱ Determine the equation of each line graphed at the right.

$b = 1$
$m = 1$

(1) $y = x + 1$

(2) $b = -2$
$m = 3$

$y = 3x - 2$



H160b

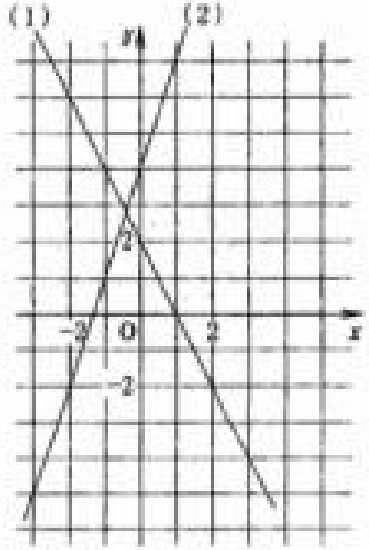
Ⅰ Determine the equation of each line graphed at the right.

(1) $y = -2x + 2$

$b = 2$
$m = -2$

(2) $b = 4$
$m = 3$

$y = 3x + 4$



(Use this coordinate plane for both graphs of (1) and (2).)

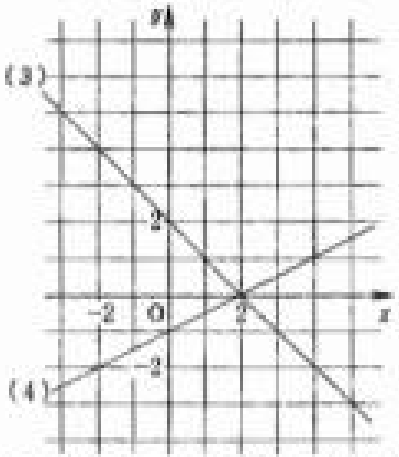
Ⅱ Determine the equation of each line graphed at the right.

(3) $b = 2$
$m = -1$

$y = -x + 2$

(4) $b = -1$
$m = \frac{1}{2}$

$y = \frac{1}{2}x - 1$



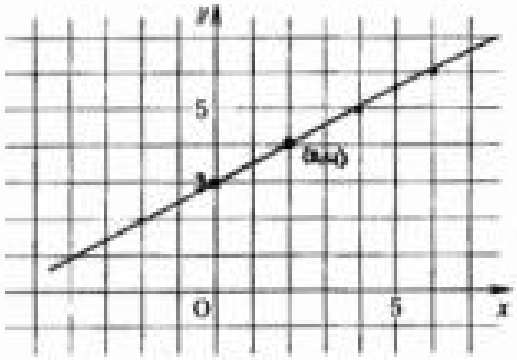
(Use this coordinate plane for both graphs of (3) and (4).)

H161a Functions and Graphs 3

Time : ～ : Date Name

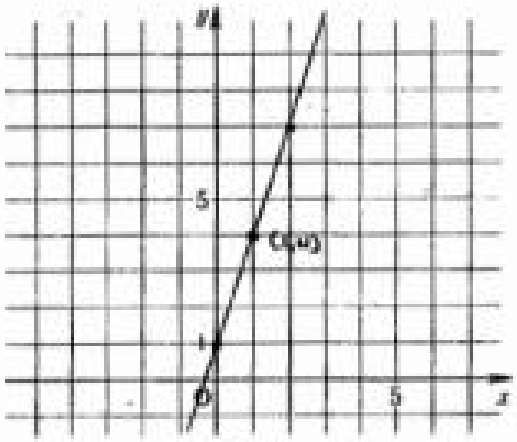
◆ Graph the following and write the numerical value in the box.

(1) A line that passes through (2, 4) and has a slope of $\frac{1}{2}$.



The y-intercept is 3.

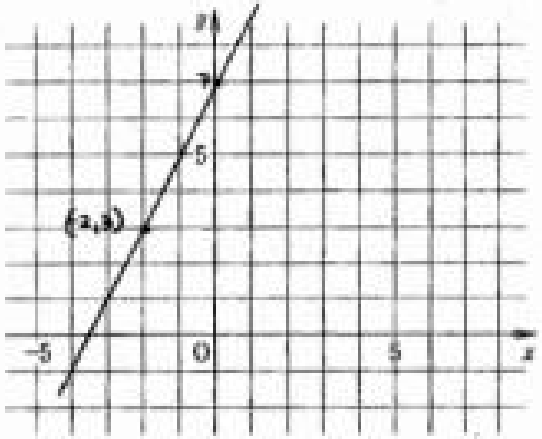
(2) A line that passes through (1, 4) and has a slope of 3.



The y-intercept is 1.

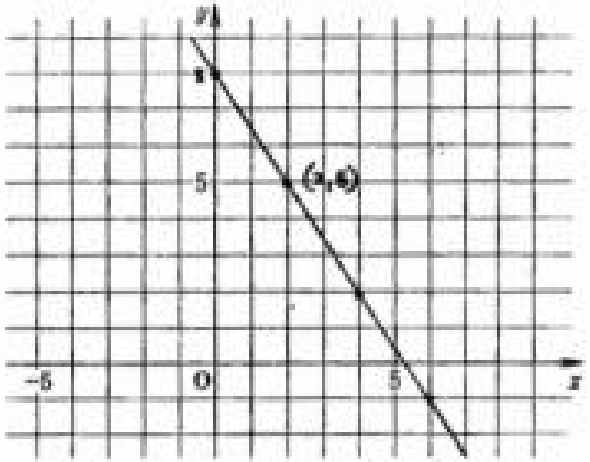
H161b

(3) A line through $(-2, 3)$ with slope 2.



The equation of the line is $y = \boxed{2}x + \boxed{7}$.

(4) A line through $(2, 5)$ with slope $-\frac{3}{2}$.



The equation of the line is $y = \boxed{-\frac{3}{2}}x + \boxed{8}$.

H162a Functions and Graphs 3

Time : to : Date Name

□I Determine the equation of a line that passes through $(2,5)$ and has a slope of $\frac{1}{2}$.

[Sol] Since the slope is $\frac{1}{2}$,

let $y=\frac{1}{2}x+b$. ···①

Since the line passes through $(2,5)$, by substituting $x=2$ and $y=5$ into ①,

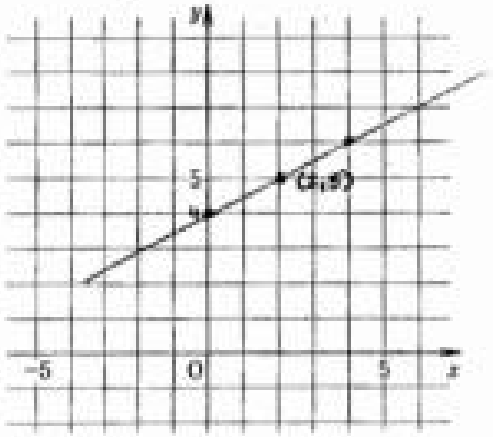
$5=\frac{1}{2}\times\boxed{2}+b$

$b=\boxed{4}$.

Substituting this value into ①,

$y=\frac{1}{2}x+\boxed{4}$.

□II Graph the above equation.



H162b

□II Determine the equation of each line.

(1) A line through $(-3,3)$ with slope $\frac{1}{2}$.

[Sol] Let $y=\boxed{\frac{1}{2}}x+b$. ···①

Substituting $x=-3$ and $y=3$ into ①,

$3=\boxed{\frac{1}{2}}\times(\boxed{-3})+b$

$b=\boxed{\frac{9}{2}}$.

Therefore, $y=\frac{1}{2}x+\frac{9}{2}$

(2) A line through $(3,6)$ with slope 2.

[Sol] Let $y=\boxed{2x+b}$. ····①

Substr. $x=3$ and $y=6$ into ①

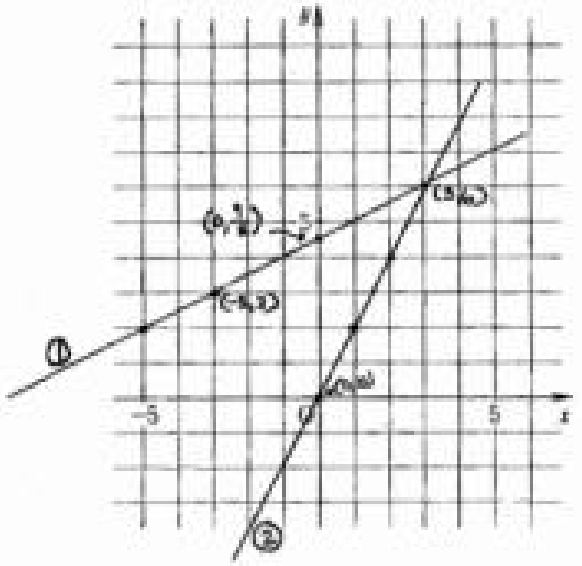
$6=2(3)+b$

$b=0$

So → $y=2x+0$

∴ $y=2x$

□IV Graph the above equations.



HI63a Functions and Graphs 3

Time : to : Date Name

□I□ Determine the equation of each line and then graph it.

(1) A line through $(2, -3)$ with slope -3.

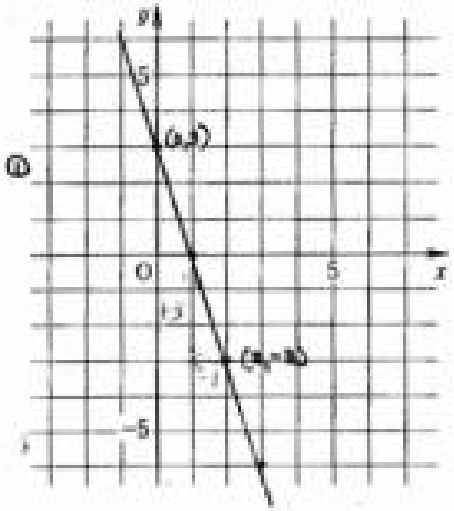
$y = -3x + b \ldots ①$

Subst. $x=2$ and $y=-3$ into ①

$-3 = -3(2) + b$

$b = 3$

$\rightarrow y = -3x + 3$



(2) A line through $(-4, 6)$ with slope $-\frac{3}{2}$.

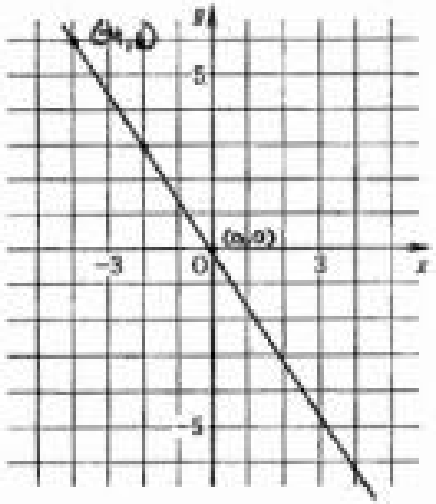
$y = -\frac{3}{2}x + b \ldots ①$

Subst. $x=-4$ and $y=6$ into ①

$6 = -\frac{3}{2}(-4) + b$

$b = 0$

$\rightarrow y = -\frac{3}{2}x$



HI63b

□II□ Determine the equation of each line.

(1) A line through $(-4, 5)$ with slope $\frac{1}{2}$.

$y = \frac{1}{2}x + b \ldots ①$

Subst. $x=-4$ and $y=5$ into ①

$5 = \frac{1}{2}(-4) + b$

$b = 7$

$y = \frac{1}{2}x + 7$

(2) A line through $(1, 4)$ with slope -3.

$y = -3x + b \ldots ①$

Subst. $x=1$ and $y=4$ into ①

$4 = -3(1) + b$

$b = 7$

$y = -3x + 7$

(3) A line through $(-6, -2)$ with slope $-\frac{1}{3}$.

$y = -\frac{1}{3}x + b \ldots ①$

Subst. $x=-6$ and $y=-$ into ①

$-2 = -\frac{1}{3}(-6) + b$

$b = -4$

$y = -\frac{1}{3}x - 4$

(4) A line through $(5, -2)$ with slope $-\frac{2}{3}$.

$y = -\frac{2}{3}x + b \ldots ①$

Subst. $x=5$ and $y=-2$ into ①

$-2 = -\frac{2}{3}(5) + b$

$b = \frac{4}{3}$

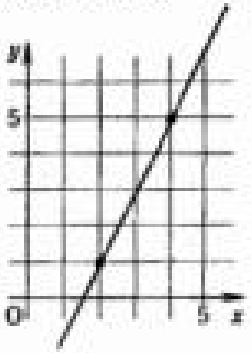
$y = -\frac{2}{3}x + \frac{4}{3}$

H164a Functions and Graphs 3

Time : to : Date Name

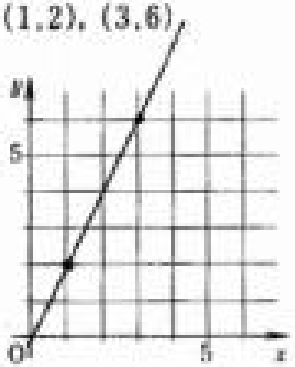
□I Find the slope of each line that passes through the given points by graphing it.

(1) (2,1), (4,5)



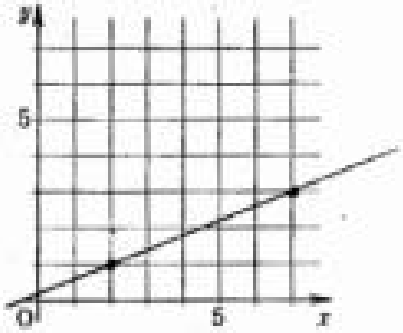
Slope 2

(2) (1,2), (3,6)



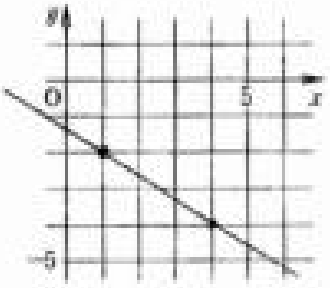
Slope 2

(3) (2,1), (7,3)



Slope $\frac{2}{5}$

(4) (1,−2), (4,−4)

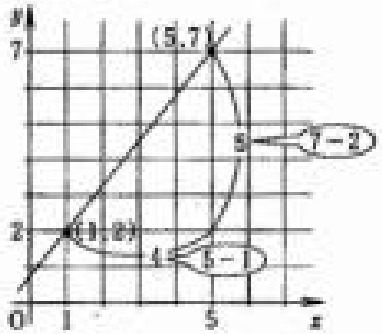


Slope $\frac{-2}{3}$

H164b

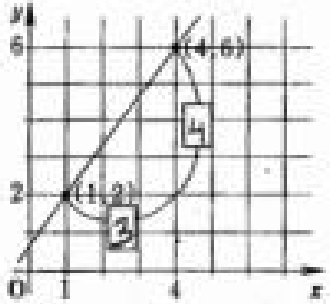
□II Find the slope of each line that passes through the given points. Write the numbers in the boxes.

(1) (1,2), (5,7)



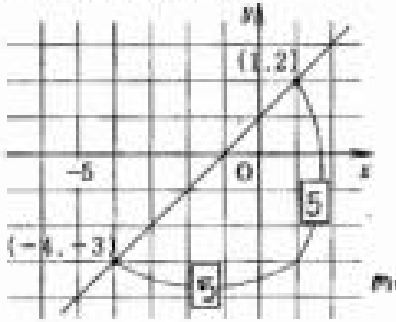
Slope $\frac{5}{4}$

(2) (1,2), (4,6)



Slope $\frac{4}{3}$

(3) (−4,−3), (1,2)



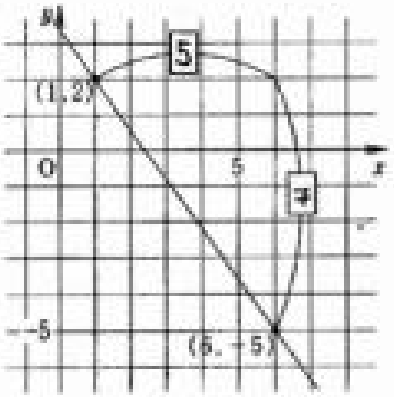
Slope 1

HI65a Functions and Graphs 3

Time : to : Date Name

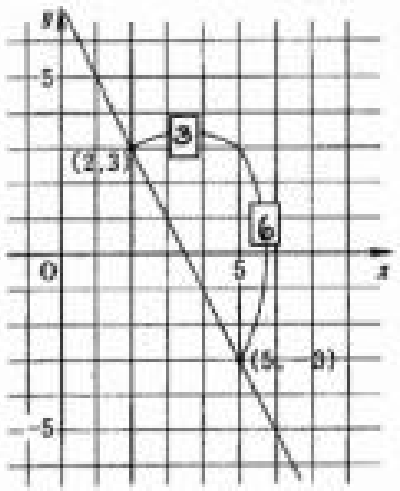
□□ Find the slope of each line that passes through the given points. Write the numbers in the box.

(1) (1,2), (6,−5)



Slope $\frac{-7}{5}$

(2) (2,3), (5,−3)



$m=\frac{-6}{3}=-2$

Slope -2

* NOTE

To find the slope HI65b

$\text{Slope}=\frac{y_2-y_1}{x_2-x_1}$

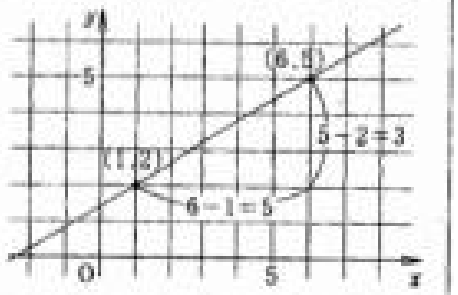
→Subtract the y-coordinates in the numerator

→subtract the x-coordinates in the denominator

□□ Find the slope of each line that passes through the given points as shown in the example.

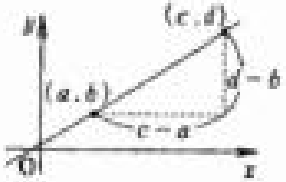
Ex. (1,2), (6,5)

[Sol] $\text{Slope}=\frac{5-2}{6-1}=\frac{3}{5}$



Note The slope of a line that passes through two points can be found as follows.

$\text{Slope}=\frac{d-b}{c-a}$



(1) (1,1), (4,3)

[Sol] $\text{Slope}=\frac{3-1}{4-\boxed{1}}=\frac{2}{\boxed{3}}$

Slope $\frac{2}{3}$

(2) (1,−2), (6,−5)

[Sol] $\text{Slope}=\frac{(-5)-(-2)}{6-\boxed{1}}=-\frac{3}{\boxed{5}}$

Slope $\frac{-3}{5}$

(3) (4,2), (5,3)

$\text{slope}=\frac{3-2}{5-4}=\frac{1}{1}=1$

Slope 1

(4) (5,−4), (7,−5)

$\text{slope}=\frac{(-5)-(-4)}{7-5}=\frac{-1}{2}$

Slope $-\frac{1}{2}$

H166a Functions and Graphs 3

Time : h : Date Name

□1 Determine the equation of a line that passes through (5, 3) and (7, 6), and then graph the equation.

[Sol 1] The slope is $\frac{6-3}{7-5}=\frac{3}{2}$.

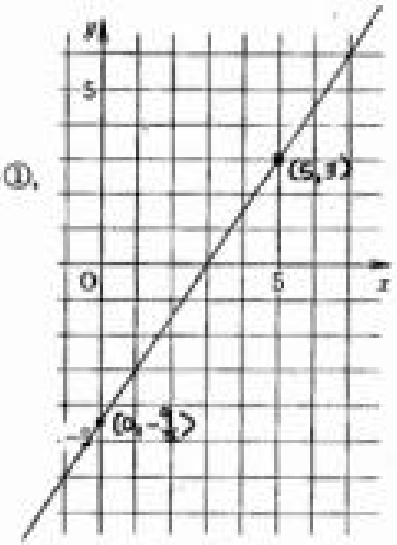
Let $y=\frac{3}{2}x+b$. ···①

Substituting $x=5$ and $y=3$ into ①,

$3=\frac{15}{2}+b$

$b=-\frac{9}{2}$

Therefore $y=\frac{3}{2}x-\frac{9}{2}$



[Sol 2] Substituting $x=7$ and $y=6$ into $y=\frac{3}{2}x+b$,

$6=\frac{21}{2}+b$

$b=-\frac{9}{2}$

Therefore $y=\frac{3}{2}x-\frac{9}{2}$

H166b

□2 Determine the equation of a line that passes through the given points, and then graph the equation.

(1) (1, 2), (3, 8)

[Sol] The slope is $\frac{8-2}{3-1}=3$.

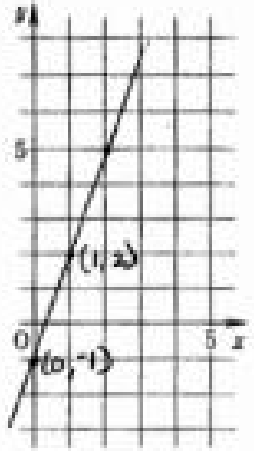
Let $y=3x+b$. ···①

Substituting $x=1$ and $y=2$ into ①.

$2=3(1)+b$

$b=-1$

$y=3x-1$



(2) (1, 1), (4, 3)

[Sol] The slope is $\frac{2}{3}$.

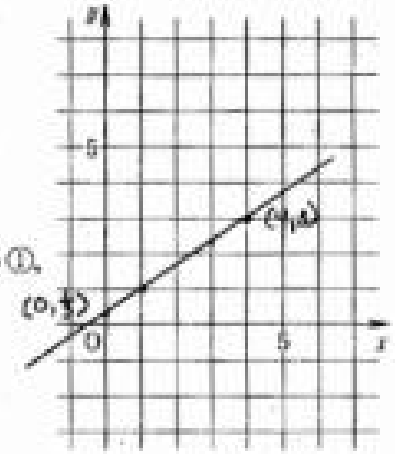
Let $y=\frac{2}{3}x+b$ ···①

Substituting $x=4$ and $y=3$ into ①,

$3=\frac{2}{3}(4)+b$

$b=\frac{1}{3}$

$y=\frac{2}{3}x+\frac{1}{3}$



H167a Functions and Graphs 3

Time : to : Date Name

◆ Determine the equation of a line that passes through the given points. First find the slope.

(1) (3, −2), (6, 1)

slope $= \frac{1-(-2)}{6-3} = \frac{3}{3} = 1$

$y = 1x + b$

$y = x + b$ .... ①

subst. $x = 3$ and $y = -2$ into ①

$-2 = 3 + b$

$b = -5$

$y = x - 5$

(2) (−1, 2), (2, −7)

slope $= \frac{(-7)-2}{2-(-1)} = \frac{-9}{3} = -3$

$y = -3x + b$ .... ①

subst. $x = -1$ and $y = 2$ into ①

$2 = -3(-1) + b$

$b = -1$

$y = -3x - 1$

H167b

(3) (3, 2), (5, −4)

slope $= \frac{(-4)-2}{5-3} = \frac{-6}{2} = -3$

$y = -3x + b$ ... ①

subst. $x = 3$ and $y = 2$ into ①

$2 = -3(3) + b$

$b = 11$

$y = -3x + 11$

(4) (−2, −6), (0, 2)

slope $= \frac{2-(-6)}{0-(-2)} = \frac{8}{2} = 4$

$y = 4x + b$ .... ①

subst. $x = 0$ and $y = 2$ into ①

$2 = 4(0) + b$

$b = 2$

$y = 4x + 2$

H168a Functions and Graphs 3

Time : to : Date Name

□I Determine the equation of a line that passes through (2,3) and (4,7), and then graph the equation.

[Sol] Let the equation of the line be

$y = mx + b$. ···①

Since the line passes through (2,3),

$3 = 2m + b$. ···②

Since the line passes through (4,7),

$7 = 4m + b$. ···③

③ − ②: $2m = \boxed{4}$

$m = \boxed{2}$

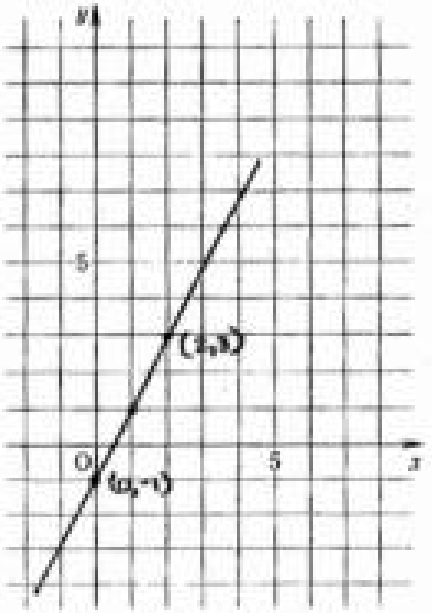
Substituting this into ②,

$3 = \boxed{2} + b$

$b = \boxed{1}$.

Substituting the values of m and b into ①,

$y = \boxed{2}x - \boxed{1}$.



H168b

□I Determine the equation of a line that passes through the given points, and then graph the equation.

(1) (6,0), (0,4)

[Sol] Let the equation of the line be

$y = mx + b$. ···①

using pt. (6,0) $0 = 6m + b$ ②

using pt. (0,4) $4 = 0m + b$ ③

so, $b = 4$

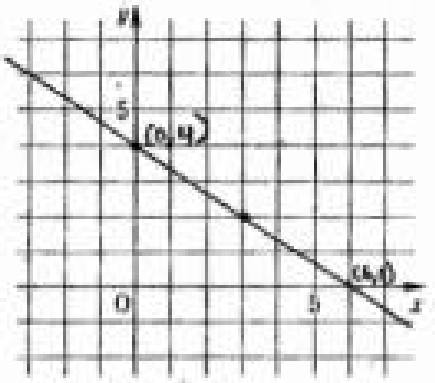
subst. into ②

$0 = 6m + 4$

$6m = -4$

$m = -\frac{2}{3}$.

so $y = -\frac{2}{3}x + 4$



(2) (−2,3), (4,5) $y = mx + b$ ①

using pt. (−2,3) $3 = -2m + b$ ②

using pt. (4,5) $5 = 4m + b$ ③

② − ③ $-6m = -2$

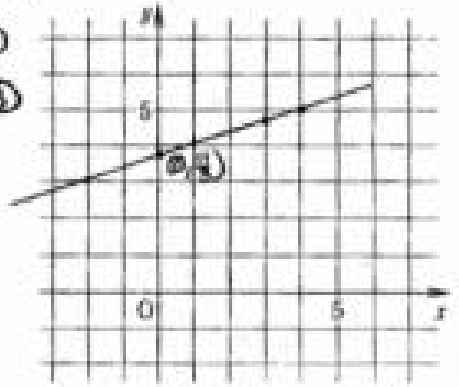
$m = \frac{1}{3}$

subst. into ②

$3 = -2(\frac{1}{3}) + b$

$b = \frac{11}{3}$

so $y = \frac{1}{3}x + \frac{11}{3}$



H169a **Functions and Graphs 3**

H169

Time : to : Date Name

- Determine the equation of a line that passes through the given points. (Let the equation of the line be $y = mx + b$.)

(1) $(-4,5), (2,8)$

let $y = mx + b$ ①

using pt. $(-4,5)$ $5 = -4m + b$ ②

using pt $(2,8)$ $8 = 2m + b$ ③

② − ③ $-6m = -3$

$m = \frac{1}{2}$

subst. into ②

$5 = -4(\frac{1}{2}) + b$

$b = 7$

so, $y = \frac{1}{2}x + 7$

(2) $(1,4), (0,7)$

let $y = mx + b$ ①

using pt. $(1,4)$ $4 = m + b$ ②

using pt. $(0,7)$ $7 = b$ ③

subst. $b=7$ into ②

$4 = m + 7$

$m = -3$

so, $y = -3x + 7$

H169b

(3) $(-6,-2), (1,1)$

let $y = mx + b$ ①

using pt. $(-6,-2)$ $-2 = -6m + b$ ②

using pt. $(1,1)$ $1 = m + b$ ③

② − ③ $-7m = -3$

$m = \frac{3}{7}$

subst into ③

$1 = \frac{3}{7} + b$

$b = \frac{4}{7}$

so, $y = \frac{3}{7}x + \frac{4}{7}$

(4) $(5,-2), (6,0)$

let $y = mx + b$ ①

using pt. $(5,-2)$ $-2 = 5m + b$ ②

using pt $(6,0)$ $0 = 6m + b$ ③

② − ③ $-m = -2$

$m = 2$

subst. into ③

$0 = 6(2) + b$

$b = -12$

so, $y = 2x - 12$

H170a Functions and Graphs 3

Time : to : Date Name

I Determine the equation of a line that passes through the given points. (First find the slope.)

(1) (0,5), (4,−1)

slope: $\frac{(-1)-5}{4-0} = -\frac{3}{2}$

$y = -\frac{3}{2}x + b$ ①

subst. $x=0$ and $y=5$ into ①

$5 = -\frac{3}{2}(0) + b$

$b = 5$

so, $y = -\frac{3}{2}x + 5$

(2) (1,−4), (4,1)

slope: $\frac{1-(-4)}{4-1} = \frac{5}{3}$

$y = \frac{5}{3}x + b$ ①

Subst. $x=4$ and $y=1$ into ①

$1 = \frac{5}{3}(4) + b$

$b = -\frac{17}{3}$

so, $y = \frac{5}{3}x - \frac{17}{3}$

H170b

I Determine the equation of a line that passes through the given points. (Let the equation of the line be $y = mx + b$.)

(1) (2,2), (4,7)

Let $y = mx + b$ ①

using pt. (2,2) $2 = 2m + b$ ②

using pt (4,7) $7 = 4m + b$ ③

② − ③ $-2m = -5$

$m = \frac{5}{2}$

Subst. into ②

$2 = 2(\frac{5}{2}) + b$

$b = -3$

so, $y = \frac{5}{2}x - 3$

(2) (−3,0), (3,−4)

Let $y = mx + b$ ①

using pt (−3,0) $0 = -3m + b$ ②

using pt (3,−4) $-4 = 3m + b$ ③

②+③ $2b = -4$

$b = -2$

subst. into ②

$0 = -3m - 2$

$3m = -2$

$m = -\frac{2}{3}$

so, $y = -\frac{2}{3}x - 2$

HI7Ia Functions and Graphs 4

Time : to : Date Name

I Find the equation of a line that:

(1) has a slope of 3 and passes through the origin.

$y = 3x + b$

Subst. $x=0$ and $y=0$

$0 = 3(0) + b$

$b = 0$ so, $y = 3x + 0 \rightarrow \boxed{y = 3x}$

(2) has a slope of 1 and a y-intercept of 2.

$m = 1$, $b = 2$ $\quad y = mx + b$

$y = x + 2$

(3) passes through the origin and point $(-3, 6)$.

$(0,0)$ $(-3,6)$

$\text{Slope} = \frac{6-0}{(-3)-0} = -2$

$y = -2x + b$

Subst. $x=0$ and $y=0$ $\rightarrow b=0$ so, $\boxed{y = -2x}$

(4) passes through the points $(6, 0)$ and $(0, 3)$.

$\text{Slope} = \frac{3-0}{0-6} = -\frac{1}{2}$

$y = -\frac{1}{2}x + b$

Subst. $x=6$ and $y=0$ $\quad 0 = -3 + b \rightarrow b = 3$ $\rightarrow$ so, $\boxed{y = -\frac{1}{2}x + 3}$

(5) passes through the points $(0, 3)$ and $(-2, -3)$.

$\text{Slope} = \frac{(-3)-3}{(-2)-0} = 3$

$y = 3x + b$

Subst. $x=0$ and $y=3$ $\quad 3 = 3(0) + b \rightarrow b = 3$ $\rightarrow$ so $\boxed{y = 3x + 3}$

HI7Ib

I Complete the following exercises.

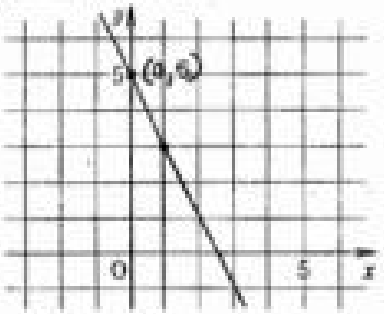
(1) Graph $2x + y = 5$. First find its slope and y-intercept.

[Sol]

Transposing $2x$ to the right side,

$y = \boxed{-2x} + 5$.

Therefore, the graph is a line that has a slope of $\boxed{-2}$ and a y-intercept of $\boxed{5}$.

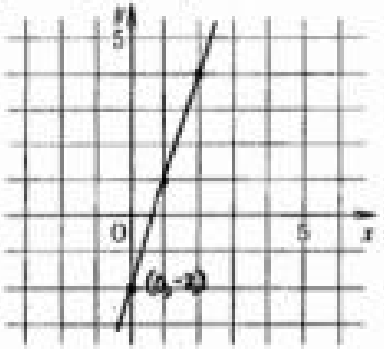


(2) Graph $3x - y = 2$. First find its slope and y-intercept.

→ transpose $3x$ to the right side: $-y = -3x + 2$

mult. both sides by -1 → $y = 3x - 2$

Slope $\boxed{3}$, y-intercept $\boxed{-2}$

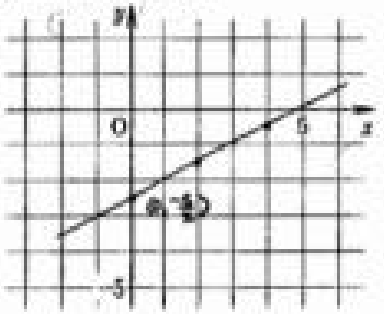


(3) Graph $x - 2y = 5$. First find its slope and y-intercept.

$-2y = -x + 5$

→ divide both sides by -2 → $y = \frac{1}{2}x - \frac{5}{2}$

Slope $\boxed{\frac{1}{2}}$, y-intercept $\boxed{-\frac{5}{2}}$



HI72a Functions and Graphs 4

Time : to : Date Name

I Graph the following equations.

(1) ① $3x - y = -3$

$-y = -3x - 3$

$y = 3x + 3$

$m = 3$: slope

$b = 3$: y-intercept

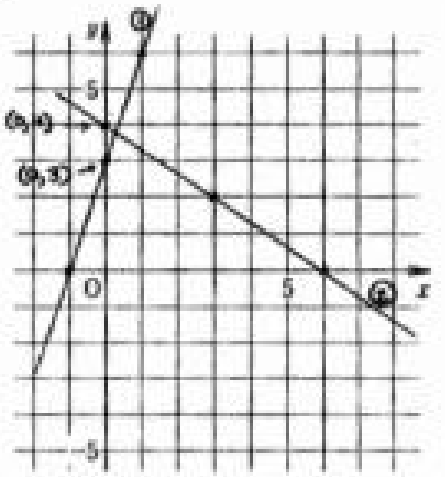
② $2x + 3y = 12$

$3y = -2x + 12$

$y = -\frac{2}{3}x + 4$

$m = -\frac{2}{3}$: slope

$b = 4$: y-intercept



(2) ① $2x - y = 5$

$-y = -2x + 5$

$y = 2x - 5$

$m = 2$: slope

$b = -5$: y-intercept

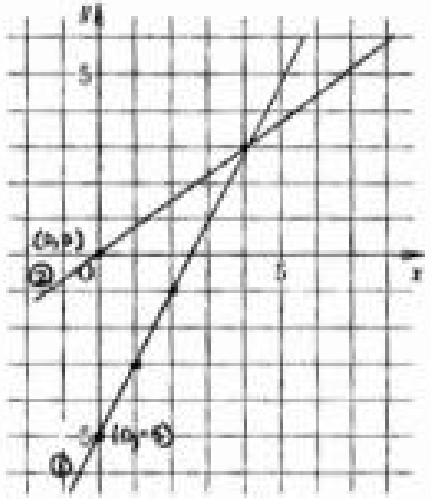
② $3x - 4y = 0$

$-4y = -3x$

$y = \frac{3}{4}x$

$m = \frac{3}{4}$: slope

$b = 0$: y-intercept



HI72b

I Complete the exercises on the following simultaneous equations:

$$\begin{cases} -4x + y = -3 & \cdots ① \\ x + 2y = 3 & \cdots ② \end{cases}$$

(1) Graph the equations and find the coordinates of the point of intersection.

① becomes $y = 4x - 3$

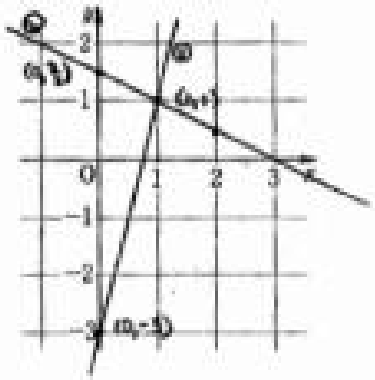
slope $= 4$ $(m = 4)$, y-intercept $= -3$ $(b = -3)$

② becomes $2y = -x + 3$

$y = -\frac{1}{2}x + \frac{3}{2}$

slope $= -\frac{1}{2}$ $(m = -\frac{1}{2})$ y-intercept $= \frac{3}{2}$ $(b = \frac{3}{2})$

Point of intersection (1 , 1)



(2) Solve the simultaneous equations.

$-4x + y = -3$ ①

$x + 2y = 3$ ②

mult. ① by 2 : $-8x + 2y = -6$ ③

② − ③ : $9x = 9$

$x = 1$

Subst. into ②

$1 + 2y = 3$

$2y = 2$

$y = 1$

Ans. $(x, y) = (1 , 1)$

Note The solution of the simultaneous equations represents the coordinates of the point of intersection of the lines of the simultaneous equations.

H173a Functions and Graphs 4

Time : to : Date Name

□I Complete the exercises on the following simultaneous equations:

$$\begin{cases} y = 2x - 3 & \cdots ① \\ x + y = 3 & \cdots ② \end{cases}$$

(1) Graph the equations and find the coordinates of the point of intersection.

① $y = 2x - 3$

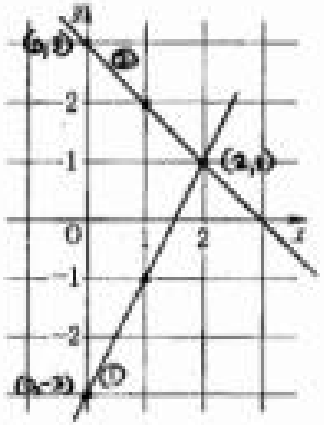
m = slope = 2

b = y-int. = −3

② becomes $y = -x + 3$

m = slope = −1

b = y-int. = 3



Point of intersection (2 , 1)

(2) Solve the simultaneous equations.

rearrange ① $2x - y = 3$ ①′

$x + y = 3$ ②

①′ + ② : $3x = 6$

$x = 2$

subst. into ②

$2 + y = 3$

$y = 1$

Ans. $(x, y) = ($ 2 , 1 $)$

H173b

□I Solve the simultaneous equations to find the coordinates of the point of intersection for the pair of lines of the simultaneous equations. Then, check the answer by graphing the equations.

(1) $\begin{cases} y = 2x - 1 & \cdots ① \\ x + 2y = 8 & \cdots ② \end{cases}$

① $m = 2$, $b = -1$

② $y = -\frac{1}{2}x + 4 \rightarrow m = -\frac{1}{2}$, $b = 4$ } for the graph

rearrange ① : $2x - y = 1$ ①′

mult. ② by 2 : $2x + 4y = 16$ ②′

①′ − ②′

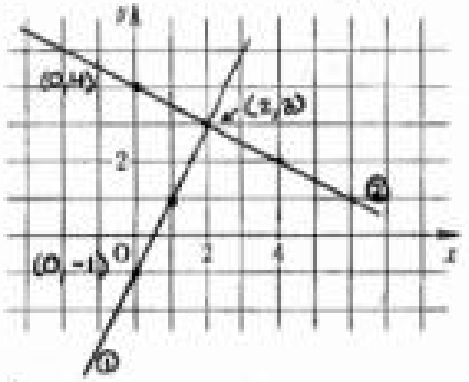
$-5y = -15$

$y = 3$

subst. into ②

$x + 6 = 8$

$x = 2$



Ans. $(x, y) = ($ 2 , 3 $)$

(2) $\begin{cases} 3x + y = 2 & \cdots ① \\ 2x - y = 3 & \cdots ② \end{cases}$

① $y = -3x + 2$, $m = -3$, $b = 2$ } for the graph

② $y = 2x - 3$, $m = 2$, $b = -3$

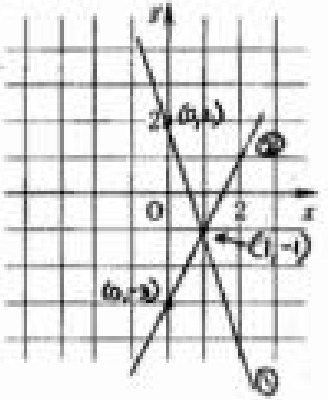
① + ② $5x = 5$

$x = 1$

subst. into ②

$2 - y = 3$

$y = -1$



Ans. $(x, y) = ($ 1 , −1 $)$

H174a Functions and Graphs 4

Time : to : Date Name

◆ Solve the simultaneous equations to find the coordinates of the point of intersection for the pair of lines of the simultaneous equations. Then, check the answer by graphing the equations.

(1) $\begin{cases} 3x-y=3 & \cdots ① \\ 3x+y-7=0 & \cdots ② \end{cases}$

① → $y=3x-3$, $m=3$, $b=-3$

② → $y=-3x+7$, $m=-3$, $b=7$ } for the graph

② becomes $3x+y=7$ ②′

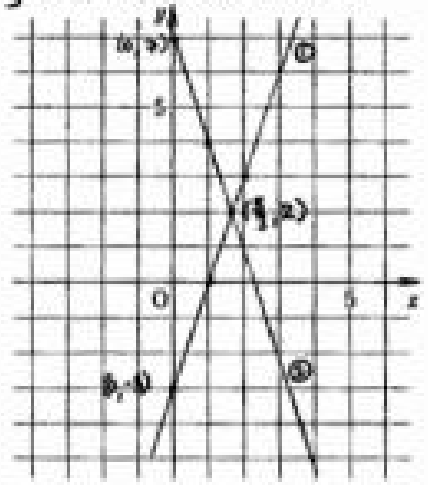
①+②′: $6x=10$

$x=\frac{5}{3}$

Subst. into ①

$5-y=3$

$y=2$



Ans. $(x, y)=\left(\frac{5}{3}, 2\right)$

H174b

For the graph:

(2) $\begin{cases} x-y-8=0 & \cdots ① \\ 2x+y-1=0 & \cdots ② \end{cases}$

① → $y=x-8$, $m=1$, $b=-8$

② → $y=-2x+1$, $m=-2$, $b=1$

rearrange:

① → $x-y=8$ ①′

② → $2x+y=1$ ②′

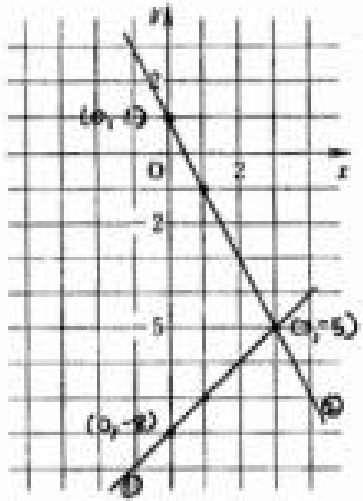
①′+②′: $3x=9$

$x=3$

Subst. into ①′

$3-y=8$

$y=-5$



Ans. $(x, y)=(3, -5)$

HI75a Functions and Graphs 4

Time : to : Date Name

◆ Solve the simultaneous equations to find the coordinates of the point of intersection for the pair of lines of the simultaneous equations. Then, check the answer by graphing the equations.

(1) $\begin{cases} 3x - y = -4 & \cdots ① \\ 2x - y = 0 & \cdots ② \end{cases}$

$y = 3x + 4$, $m = 3$, $b = 4$

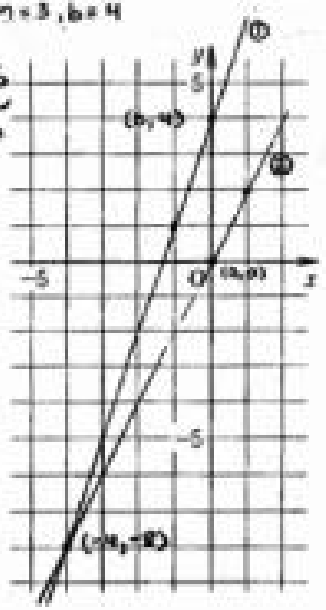
$y = 2x$, $m = 2$, $b = 0$ for the graph

① − ② $x = -4$

Subst. into ②

$-8 - y = 0$

$y = -8$



Ans. $(x, y) = (\ -4\ ,\ -8\ )$

HI75b

For the graph:

(2) $\begin{cases} x + 2y = 7 & \cdots ① \\ \frac{x}{3} + \frac{y}{2} = 2 & \cdots ② \end{cases}$

$y = -\frac{1}{2}x + \frac{7}{2}$, $m = -\frac{1}{2}$, $b = \frac{7}{2}$

$y = -\frac{2}{3}x + 4$, $m = -\frac{2}{3}$, $b = 4$

mult. ② by 6: $2x + 3y = 12$ ②′

mult. ① by 2: $2x + 4y = 14$ ①′

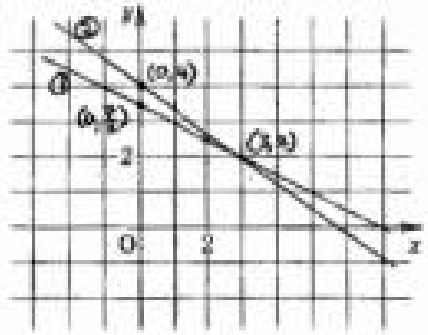
②′ − ①′ : $-y = -2$

$y = 2$

subst. into ①

$x + 4 = 7$

$x = 3$



Ans. $(x, y) = (\ 3\ ,\ 2\ )$

H176a Functions and Graphs 4

Time : to : Date Name

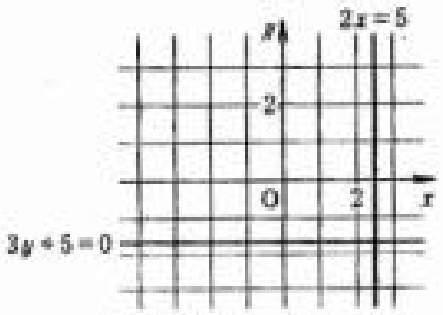
□I Graph the following equations as shown in the examples.

Ex. ① $2x=5$

[Sol] $x=\frac{5}{2}$

② $3y+5=0$

[Sol] $y=-\frac{5}{3}$



Note The equation $2x=5$ represents all the points whose x-coordinate is $\frac{5}{2}$. Therefore, its graph is a line that passes through the point $\left(\frac{5}{2},0\right)$ and is parallel to the y-axis. Also, the equation $3y+5=0$ represents all the points whose y-coordinate is $-\frac{5}{3}$; its graph is a line that passes through the point $\left(0,-\frac{5}{3}\right)$ and is parallel to the x-axis.

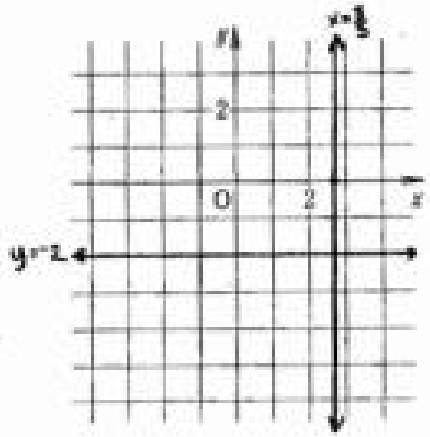
(1) $3x=8$

$x=\frac{8}{3}$

(2) $2y+4=0$

$2y=-4$

$y=-2$



H176b

□II Graph the equation $ax+by+c=0$. Substitute the following numbers for the letters.

(1) $a=2, b=0, c=-3$

$2x-3=0$

$2x=3$

$x=\frac{3}{2}$

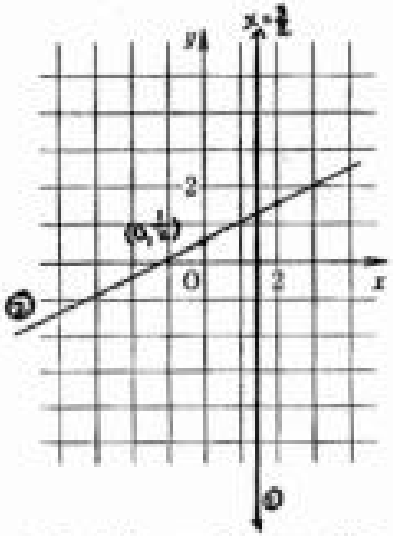
(2) $a=1, b=-2, c=1$

$x-2y+1=0$

$-2y=-x-1$

$y=\frac{1}{2}x+\frac{1}{2}$

$\rightarrow m=\frac{1}{2}, b=\frac{1}{2}$



□III Solve the simultaneous equations to find the coordinates of the point of intersection for the pair of lines of the simultaneous equations. Then, check the answer by graphing the equations.

$\begin{cases} 3x-y=2 \cdots ① \\ y=4 \quad \cdots ② \end{cases}$

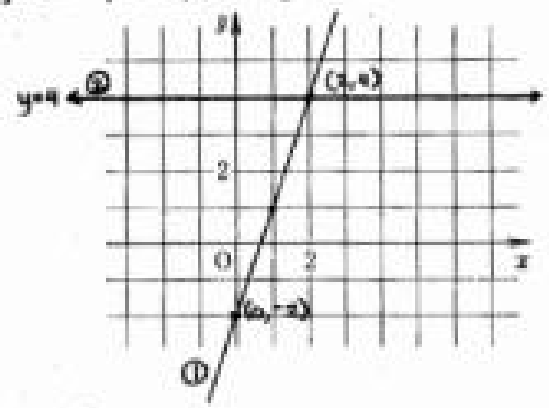
$y=3x-2$, $m=3$, $b=-2$ } for graph

subst. ② into ①

$3x-4=2$

$3x=6$

$x=2$



Ans. $(x,y)=(2,4)$

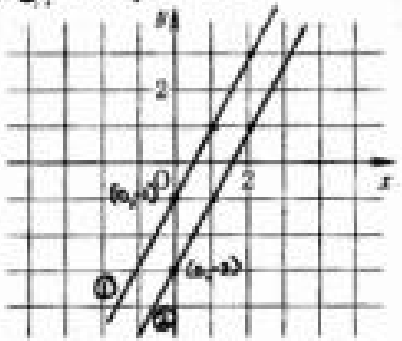
H177a Functions and Graphs 4

Time : to : Date Name

□I Graph the following equations to verify that there is no point of intersection.

$$\begin{cases} 2x-y=1 & \cdots① \\ 4x-2y=6 & \cdots② \end{cases}$$

① $y=2x-1$, $m=2$, $b=-1$
② $y=2x-3$, $m=2$, $b=-3$
} for graph

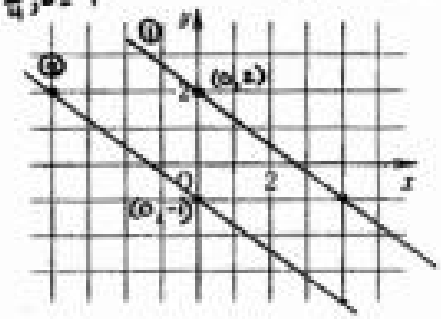


Note If we try to solve the given simultaneous equations, the operation ①×2−② equals a false equation, $0=-4$. Therefore, the simultaneous equations have no solution, and their lines have no point of intersection. !

□II Graph the following equations.

$$\begin{cases} 3x+4y=8 & \cdots① \\ y=-\frac{3}{4}x-1 & \cdots② \end{cases}$$

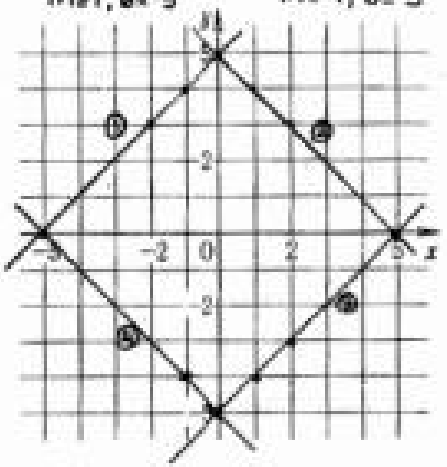
① $y=-\frac{3}{4}x+2$ $m=-\frac{3}{4}$, $b=2$
② $m=-\frac{3}{4}$, $b=-1$
} for graph



H177b

□I The graphs of the given equations form a quadrilateral (a four sided figure) with 4 vertices. Write the coordinates of the vertex where the following lines intersect.

① $y=x+5$ $m=1$ $b=5$
② $x+y=5$ $y=-x+5$ $m=-1$ $b=5$
③ $x-y-5=0$ $y=x-5$ $m=1$, $b=-5$
④ $y=-(x+5)$ $y=-x-5$ $m=-1$, $b=-5$



(1) ① and ②: (0 , 5)

(2) ② and ③: (5 , 0)

(3) ③ and ④: (0 , -5)

(4) ④ and ①: (-5 , 0)

H178a Functions and Graphs 4

Time : to : Date Name

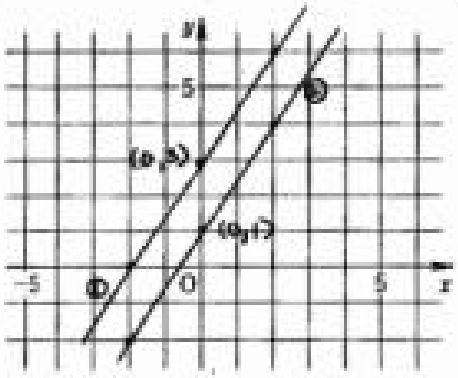
I Graph each of the following equations by using its y-intercept and slope.

(1) $y=\frac{3}{2}x+3$

$m=\frac{3}{2}$
$b=3$

(2) $y=\frac{3}{2}x+1$

$m=\frac{3}{2}$, $b=1$

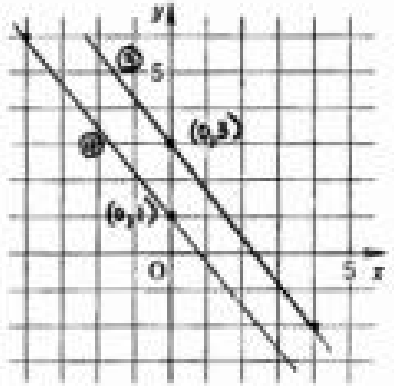


(3) $y=-\frac{5}{4}x+3$

$m=-\frac{5}{4}$
$b=3$

(4) $y=-\frac{5}{4}x+1$

$m=-\frac{5}{4}$
$b=1$



Note Lines (1) and (2) are parallel. Lines (3) and (4) are parallel. If the slopes of the lines are equal, their lines are parallel. !

H178b

II Find the equation of a line that both passes through the point $(-4, 5)$ and is parallel to the line of the given equation.

(1) $y=\frac{1}{2}x-2$

Hint Find the equation of the line that passes through $(-4, 5)$ and has a slope of $\frac{1}{2}$. $m=\frac{1}{2}$

$y=mx+b$
$y=\frac{1}{2}x+b$
subst. $x=-4$ and $y=5$
$5=\frac{1}{2}(-4)+b$
$b=7$
$y=\frac{1}{2}x+7$

(3) $y=\frac{3}{2}x-4$

$m=\frac{3}{2}$
$y=\frac{3}{2}x+b$
subst. $x=-4$ and $y=5$
$5=\frac{3}{2}(-4)+b$
$b=11$
$y=\frac{3}{2}x+11$

(2) $y=-3x+1$

$m=-3$
$y=-3x+b$
subst. $x=-4$ and $y=5$
$5=-3(-4)+b$
$b=-7$
$y=-3x-7$

(4) $y=-\frac{5}{4}x+3$

$m=-\frac{5}{4}$
$y=-\frac{5}{4}x+b$
subst. $x=-4$ and $y=5$
$5=-\frac{5}{4}(-4)+b$
$b=0$
$y=-\frac{5}{4}x$

H179a Functions and Graphs 4

Time : to : Date Name

I Identify four pairs of parallel lines from the following equations. Write the numbers in the boxes.

① $y=\frac{1}{4}x+3$ ② $-4y=5$, $y=-\frac{5}{4}$ ③ $y=-x+8$

④ $-\frac{1}{2}x=1$, $x=-2$ ⑤ $\frac{1}{3}y-1=0$, $y=3$ ⑥ $4y-x+8=0$, $y=\frac{1}{4}x-2$

⑦ $\frac{x}{3}+\frac{y}{3}=1$, $y=-x+3$ ⑧ $3x-10=0$, $x=\frac{10}{3}$

(1) 1 and 6 $m=\frac{1}{4}$

(2) 2 and 5 both horizontal lines.

(3) 3 and 7 $m=-1$

(4) 4 and 8 both vertical lines.

II Find the equation of a line that:

(1) passes through the point $(0, 4)$ and is parallel to $y=\underset{m}{2}x-2$.

$m=2$

$y=2x+b$

Subst. $x=0$ and $y=4$

$4=0+b$

$b=4$

$y=2x+4$

H179b

(2) passes through the point $(-3, 0)$ and is parallel to $\frac{x}{3}+\frac{y}{4}=1$.

$\frac{x}{3}+\frac{y}{4}=1$ ①

mult. both sides by 12

$4x+3y=12$

$3y=-4x+12$

$y=-\frac{4}{3}x+4$

$\rightarrow m=-\frac{4}{3}$

so, $y=-\frac{4}{3}x+b$ ②

Subst. $x=-3$ and $y=0$ into ②

$0=-\frac{4}{3}(3)+b \Rightarrow b=-4$ so $y=-\frac{4}{3}x-4$

(3) passes through the point $(0, -2)$ and is parallel to a line that goes through the points $(4, 0)$ and $(0, 3)$.

Slope $=\frac{3-0}{0-4}=-\frac{3}{4}$

$y=-\frac{3}{4}x+b$

Subst. $x=0$ and $y=-2$

$-2=-\frac{3}{4}(0)+b$

$b=-2$

$y=-\frac{3}{4}x-2$

H180a Functions and Graphs 4

Time : to : Date Name

□□ Find the equation of a line that:

(1) intersects with $y = 2x - 1$ on the y-axis and is parallel to $y = -x$.

from $b = -1$ from $m = -1$

$y = mx + b$

$y = -x - 1$

(2) passes through the points $(-2, -3)$ and $(4, 1)$.

$$\text{slope} = \frac{1-(-3)}{4-(-2)} = \frac{4}{6} = \frac{2}{3}$$

$y = \frac{2}{3}x + b$

subst. $x = 4$ and $y = 1$

$1 = \frac{2}{3}(4) + b$

$b = -\frac{5}{3}$ so, $y = \frac{2}{3}x - \frac{5}{3}$

(3) passes through the points $(-4, 3)$ and $(-4, -2)$.

$$\text{slope} = \frac{(-2)-3}{(-4)-(-4)} = \frac{-5}{0}$$ * no slope

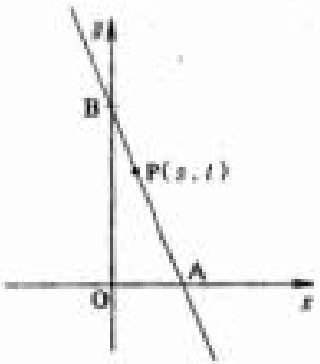
⇓ vertical line

* Remember! You can never divide by zero.

⟹ $\boxed{x = -4}$

H180b

□□ The line $y = mx + b$ intersects with the x-axis at point A and with the y-axis at point B and passes through point $P(s, t)$. Write the appropriate letter in each box.



(1) The value of b is equal to the [y]-coordinate of point [B].

pt. $(0, b)$

(2) m, b, s and t determine the equation [t] $= ms + b$.

□□ If y°C is the temperature at the altitude of x km when the temperature at ground level is 15°C, y is given by the linear function $y = -6x + 15$. According to this function,

(1) as the altitude increases by 1 km, the temperature decreases by [6] °C.

$$\text{slope} = \frac{-6}{1} = \frac{^\circ C}{km}$$

(2) the temperature at 3 km above ground is [-3] °C.

$y = -6(3) + 15$

$y = -3$

H181a Simplifying Monomials and Polynomials 1

Time : to : Date Name

◆ Simplify as shown in the examples.

Ex.

$a \times 3b = 3ab$	$3x \times (-6y) = -18xy$
$2a \cdot 3b^2 = 6ab^2$	$(-3x) \times (-6y) = 18xy$

(1) $a \times 2b = \boxed{2}ab$

(2) $3a \cdot 5b = 15\boxed{ab}$

(3) $5a \times 4b^2 = \boxed{20}ab^2$

(4) $8a \cdot 3c^2 = 24ac^2$

(5) $abc \cdot 3xy = \boxed{3}abc\boxed{x}y$

(6) $ab \cdot \frac{5}{2}xyz = \frac{5}{2}abxyz$

(7) $2xy \cdot \frac{3}{z}z = 6xyz$

(8) $\frac{1}{2}ab \times 2c^2 = \frac{1}{2}abc^2$

(9) $2a^2 \times \frac{1}{2}b^2c^2 = 2a^2b^2c^2$

(10) $2x \times (-3y) = -\boxed{6}xy$

(11) $(-3x) \cdot 2y = \boxed{-6}xy$

(12) $7x \times (-2y) = -14xy$

(13) $(-6x) \cdot (-5y) = 30xy$

(14) $3ab \cdot (-2x) = \boxed{-6}ab\boxed{x}$

(15) $(-5x) \cdot (-8ab) = 40abx$

(16) $\left(-\frac{2}{3}m\right) \cdot 4xy = -\frac{8}{3}mxy$

(17) $\frac{2}{3}a\left(-\frac{1}{2}bc\right) = -\frac{1}{3}abc$

(18) $4x(-3y)(2x) = -24xyz$

H181b

Ex.

$3a \cdot 5a = 15a^2$
$3a \cdot 5a \cdot (-3a) = -45a^3$

(19) $4a \cdot 8a = \boxed{32}a^2$

(20) $-5x \cdot 6x = -\boxed{30}x^{\boxed{2}}$

(21) $3y \cdot (-6y) = -18y^2$

(22) $(-3x) \cdot (-4x) = 12x^2$

(23) $a \times (-5a) = -5a^2$

(24) $a \times (-5a) \times (-2a) = \boxed{10}a^3$

(25) $x \cdot 3x \cdot 2x = \boxed{6}x^{\boxed{3}}$

(26) $2y \cdot 4y \cdot (-y) = -8y^3$

(27) $\left(-\frac{1}{2}b\right)\left(-\frac{1}{2}b\right)(3b) = 3b^3$

(28) $a \cdot 2a \cdot 3a \cdot 4a = 24a^4$

HI82

HI82a Simplifying Monomials and Polynomials 1

Time : to : Date Name

◆ Simplify as shown in the examples.

Ex. $x^2 \cdot x^5 = (x \cdot x) \cdot (x \cdot x \cdot x \cdot x \cdot x) = x^7$
$x \cdot x^4 = x \cdot (x \cdot x \cdot x \cdot x) = x^5$

(1) $x^2 \cdot x^3 = x^{[5]}$
$(= (x \cdot x) \cdot (x \cdot x \cdot x))$

(2) $x^3 \cdot x^6 = (x \cdot x \cdot x) \cdot (x \cdot x \cdot x \cdot x \cdot x \cdot x) = x^9$

(3) $x^3 \cdot x = (x \cdot x \cdot x) \cdot x = x^4$

(4) $y \cdot y^3 = y^{[4]}$

(5) $x \cdot x^2 \cdot x^3 = x^{[6]}$

(6) $a^2 \times a^3 \times a^4 = a^{[9]}$

(7) $b^2 \cdot b \cdot b^4 = b^{[7]}$

(8) $c \times c^3 \times c = c^5$

(9) $y^3 \times y^2 \times y = y^6$

(10) $z^5 \cdot z \cdot z^2 = z^8$

(11) $x \times x^3 \times x^4 = x^8$

HI82b

Ex. $3x^2 \cdot (-5x^5) = -15x^7$
$\frac{3}{2}x \times 4x^7 = 6x^8$

(12) $4x^3 \cdot (-3x^4) = -\boxed{12}x^{[7]}$

(13) $3a^4 \times 5a^2 = \boxed{15}a^{[6]}$

(14) $-3a^2 \cdot 2a^3 = \boxed{-6}a^{[5]}$

(15) $2x \cdot x^3 = \boxed{2}x^{[4]}$

(16) $3a^3 \times 2a^2 = \boxed{6}a^{[5]}$

(17) $2a^3 \cdot 5a^4 = 10a^7$

(18) $4a^4 \cdot 4a^4 = 16a^8$

(19) $\frac{1}{2}x \cdot \left(-\frac{3}{2}x^3\right) = -3x^3$

(20) $(-3x^2)(-7x) = 21x^3$

(21) $\frac{2}{3}a^3 \cdot 6a = 4a^4$

(22) $\frac{2}{3}a^3 \cdot 6a^4 = 4a^7$

(23) $2x^2 \cdot 3x^3 \cdot x^4 = \boxed{6}x^{[9]}$

(24) $(-2x^3)(3x^2) \cdot x^4 = \boxed{-6}x^{[9]}$

(25) $y \cdot \left(-\frac{1}{2}y^3\right) \cdot \left(\frac{1}{2}y^2\right) = -y^6$

(26) $2a^2 \times 2a^2 \times 2a^2 = 8a^6$

(27) $(-3b^3)(-3b^3)(-3b^3) = -27b^9$

H183a Simplifying Monomials and Polynomials 1

Time : to : Date Name

◆ Simplify as shown in the example.

Ex. $3a^2b \times 4a^3 = 12a^5b$

Note The procedure for simplifying is as follows:
① Determine the sign of the answer.
② Calculate the numbers in front of the letters.
③ Calculate the exponents.

(1) $-3ab \times 6a^3 = \boxed{-18}\,a^{\boxed{3}}b$

(2) $\frac{5}{2}a \cdot \frac{1}{4}ab = \frac{\boxed{5}}{\boxed{8}}\,a^{\boxed{2}}\boxed{b}$

(3) $-3x^4y^5 \times 4x^4y = \boxed{-12}\,x^{\boxed{8}}y^{\boxed{6}}$

(4) $3x^2y^3 \cdot (-6x^3y) = \boxed{-18}\,x^{\boxed{5}}y^{\boxed{4}}$

(5) $15a^2b^2 \times 0 = \boxed{0}$

(6) $(-2a^2b)(-3a^3b^3) =$ $6a^5b^4$

(7) $\frac{1}{3}x^2y\left(-\frac{5}{2}x^2y^4\right) =$ $-\frac{5}{2}x^4y^5$

(8) $2amn \cdot \frac{3}{5}ax \cdot n = \frac{\boxed{6}}{5}\,a^{\boxed{2}}mn^{\boxed{2}}x$

(9) $4a(-2ax)(xy) = \boxed{-8}\,a^{\boxed{2}}x^{\boxed{2}}y$

(10) $(-2ab)(-5b)(6abc) = \boxed{60}\,a^{\boxed{2}}b^{\boxed{2}}c$

H183b

(11) $4xy \cdot 7x^2 = \boxed{28}\,x^{\boxed{3}}y$

(12) $4x^2y(-3xy) = \boxed{-12}\,x^{\boxed{3}}y^{\boxed{2}}$

(13) $-2x^3 \times 8x^2y =$ $-16x^5y$

(14) $3x^2y \times 1 =$ $3x^2y$

(15) $5ax \times (-4a^2) =$ $-20a^3x$

(16) $-x^3y^2 \cdot (-3x^2y^2) =$ $3x^4y^4$

(17) $-2 \cdot 2a^2b^3 \cdot 2a^3b^3 =$ $-8a^6b^6$

(18) $-3a^2 \cdot 4ab^3 \cdot (-5) =$ $60a^3b^3$

(19) $-x^2y \cdot (-2xy^3) \cdot 6x^2y^2 =$ $12x^5y^6$

(20) $(-3a^3b)(-2a^5b^7)(4ab^2) =$ $24a^9b^{10}$

(21) $3xy \cdot 2yz(-5zx) =$ $-30x^2y^2z^2$

(22) $6x^3y^4z \cdot 5x^2y^3z^2 \cdot 2xyz =$ $60x^6y^8z^4$

H184a Simplifying Monomials and Polynomials 1

Time : to : Date Name

◆ Simplify as shown in the examples.

Ex. $(a^5)^2 = a^5 \cdot a^5 = a^{10}$

$(2ab^2)^3 = 2ab^2 \cdot 2ab^2 \cdot 2ab^2 = 8a^3b^6$

(1) $(a^3)^3 = a^{[9]}$

$(= a^3 \cdot a^3 \cdot a^3)$

(2) $(a^4b)^2 = a^{[8]}b^{[2]}$

(3) $(3a^2)^2 = [9]a^{[4]}$

(4) $(5a^3b)^2 = [25]a^{[6]}b^{[2]}$

(5) $(2a^3)^3 = [8]a^{[9]}$

$(= 2a^3 \cdot 2a^3 \cdot 2a^3)$

(6) $(2a^2bc^3)^3 = [8]a^{[6]}b^{[3]}c^{[9]}$

(7) $(a^3b^4c)^4 = a^{12}b^{[16]}c^{[4]}$

(8) $(3a^3b^2c)^4 = [81]a^{[12]}b^{[8]}c^{[4]}$

H184b

(9) $(a^3)^4 = a^{[12]}$

(10) $(4x^2y^4)^2 = [16]x^{[4]}y^{[8]}$

(11) $(3x^3yz^2)^3 = [27]x^{[9]}y^{[3]}z^{[6]}$

(12) $(2x^4yz)^4 = 16x^{16}y^4z^4$

(13) $\left(\frac{1}{2}ab^2c^3\right)^2 = \frac{[1]}{4}a^{[2]}b^{[4]}c^{[6]}$

(14) $\left(\frac{1}{2}ab^2c^3\right)^3 = \frac{1}{8}a^3b^6c^9$

(15) $\left(\frac{2}{3}x^3yz^3\right)^3 = \frac{8}{27}x^9y^3z^9$

(16) $[(x^2)^3]^4 = [x^6]^4 = x^{[24]}$

(17) $[(x^4)^3]^3 = [x^{[12]}]^3 = x^{36}$

(18) $[(2x^4)^2]^3 = [4x^{[8]}]^3 = [64]x^{[24]}$

HI85a Simplifying Monomials and Polynomials 1

Time : to : Date Name

◆ Simplify as shown in the examples.

Ex. $(-2ab)^2=(-2ab)\cdot(-2ab)=4a^2b^2$
$(-2ab)^3=(-2ab)\cdot(-2ab)\cdot(-2ab)=-8a^3b^3$

Note First determine the sign of the answer.

(1) $(-2x)^3=\boxed{-8}x^3$
$=(-2x)(-2x)(-2x)$

(2) $(-2a^2)^4=\boxed{16}a^{8}$

(3) $(-3a^2b^3)^3=\boxed{-27}a^6b^9$

(4) $(-3a^2b^3)^4=\boxed{81}a^{8}b^{12}$

(5) $(-3ac^3)^3=-27a^3c^9$

(6) $(-3a^2b)^4=81a^8b^4$

(7) $(-3ab^2c^3)^5=\boxed{-243}a^5b^{10}c^{15}$

(8) $(-2ab^2c^3)^6=64a^6b^{12}c^{18}$

HI85b

(9) $(-4x)^3=\boxed{-64}x^3$

(10) $(-2a^3b)^4=\boxed{16}a^{12}b^{4}$

(11) $\left(-\frac{1}{2}ab^3\right)^5=-\frac{1}{\boxed{32}}a^{5}b^{15}$

(12) $\left(-\frac{1}{2}ab^3\right)^4=\frac{1}{\boxed{16}}a^{4}b^{12}$

(13) $\left(-\frac{1}{3}ab^3\right)^4=\frac{1}{81}a^4b^{12}$

(14) $\left(-\frac{1}{2}a^2x^3\right)^5=-\frac{1}{32}a^{10}x^{15}$

(15) $\left(-\frac{2}{3}a^2b^3\right)^3=-\frac{\boxed{8}}{27}a^{6}b^{9}$

(16) $\left(-\frac{2}{3}a^3b^3\right)^4=\frac{\boxed{16}}{81}a^{12}b^{12}$

(17) $\left(-\frac{3}{4}a^4b^3\right)^3=-\frac{27}{64}a^{12}b^9$

(18) $\left(-\frac{2}{3}a^2bc^3\right)^5=-\frac{32}{243}a^{10}b^5c^{15}$

HI86a Simplifying Monomials and Polynomials 1

Time : to : Date Name

● Simplify.

(1) $x^3 \cdot x^2 = x^{5}$
$(=(x \cdot x \cdot x) \cdot (x \cdot x))$

(2) $(x^3)^2 = x^{6}$
$(=x^3 \cdot x^3)$

(3) $2(x^3)^2 = 2x^{6}$
$(=2 \cdot x^3 \cdot x^3)$

(4) $(2x^3)^2 = \boxed{4}x^{6}$
$(=2x^3 \cdot 2x^3)$

(5) $(5x^2y^3)^2 = \boxed{25}x^4y^{6}$

(6) $5(x^2y^3)^2 = \boxed{5}x^{4}y^{6}$

(7) $5a^3(b^3c^3)^2 = 5a^3b^6c^{6}$

(8) $2a^3(bc^2)^3 = 2a^3b^{3}c^{6}$

(9) $3x(y^2z^2)^3 = 3xy^6z^6$

(10) $3a^3(x^2yz^3)^4 = 3a^3x^8y^4z^{12}$

HI86b

(11) $5x^3(x^3yz^3)^2 = 5x^3 \cdot x^6y^{2}z^{6} = 5x^9y^{2}z^{6}$

(12) $2x^2(x^3yz^3)^2 = 2x^2 \cdot x^6y^2z^6 = 2x^8y^2z^6$

(13) $2x^2(3x^3y^2)^2 = 2x^2 \cdot 9x^{6}y^{4} = 18x^8y^4$

(14) $2y^3(2xy^2)^3 = 2y^3 \cdot 8x^3y^6 = 16x^3y^9$

(15) $3a^3(4a^2b^3)^2 = 3a^3 \cdot 16a^4b^6 = 48a^7b^6$

(16) $(3a)^2(2a)^3 = 9a^2 \cdot \boxed{8}a^{3} = \boxed{72}a^5$

(17) $(3a^3)^2(2a^2)^3 = 9a^6 \cdot 8a^6 = 72a^{12}$

(18) $(3x)^3(x^2y^3)^3 = 27x^3 \cdot x^6y^9 = 27x^9y^9$

(19) $(2x^2y)^2(2xy^2)^3 = 4x^4y^2 \cdot 8x^3y^6 = 32x^7y^8$

(20) $\left(\frac{1}{3}x^2y\right)^2(3xy^2)^3 = \frac{1}{9}x^4y^2 \cdot 9x^3y^6 = x^7y^8$

H187

H187a Simplifying Monomials and Polynomials 1

Time : to : Date Name

◆ Simplify.

(1) $(-x)^2 = x^{[2]}$

(2) $(-x)^3 = -x^{[3]}$

(3) $(-3x^2)^3 = \boxed{-27}x^{[6]}$

(4) $2(-3x^2)^3 = 2\cdot(\boxed{-27}x^{[6]}) = \boxed{-54}x^{[6]}$

(5) $5x(-yz^2)^3 = 5x\cdot(-y^3z^{[6]}) = -5xy^3z^{[6]}$

(6) $4a^3(-2b^2c)^4 = 4a^3\cdot\boxed{16}b^{[8]}c^{[4]} = 64a^3b^8c^4$

(7) $3ab(-2ab^2)^4 = 3ab\cdot\boxed{16}a^4b^{[8]} = \boxed{48}a^5b^{[9]}$

(8) $2x^2y(-3x^2y^2)^3 = 2x^2y\cdot(-27x^6y^6) = -54x^8y^7$

(9) $\frac{2}{3}ax(-3xy)^3 = \frac{2}{\cancel{3}_1}ax\cdot(\frac{-\cancel{27}^{9}}{}x^3y^3) = -18ax^4y^3$

(10) $3ab^2\left(-\frac{2}{3}bc^3\right)^3 = \overset{1}{\cancel{3}}ab^2\cdot\left(\frac{-8}{\underset{9}{27}}b^3c^6\right) = -\frac{8}{9}ab^5c^6$

H187b

(11) $(-a)^3 = -a^3$
$=(-a)(-a)(-a)$

(12) $-(-a)^3 = a^3$
$=-(-a)(-a)(-a)$

(13) $-3(-ab^2)^3 = -3\cdot(-a^3b^{[6]}) = 3a^3b^6$

(14) $-3(-ab^2)^2 = -3\cdot a^2b^{[4]} = -3a^2b^4$

(15) $-2a(-b^3c)^3 = -2a\cdot(-b^9c^3) = 2ab^9c^3$

(16) $-2x^2y(-yz^3)^2 = -2x^2y\cdot y^2z^{[6]} = -2x^2y^{[3]}z^{[6]}$

(17) $-4ab\left(-\frac{1}{2}ab^2\right)^3 = \overset{1}{\cancel{-4}}ab\cdot\left(-\frac{1}{\underset{2}{\cancel{8}}}a^3b^6\right) = \frac{1}{2}a^4b^7$

(18) $-4ab\left(-\frac{1}{2}ab^2\right)^4 = \overset{1}{\cancel{-4}}ab\cdot\frac{1}{\underset{4}{\cancel{16}}}a^4b^8 = -\frac{1}{4}a^5b^9$

(19) $-\frac{2}{3}xy\left(-\frac{1}{2}ax\right)^2 = -\frac{\overset{1}{\cancel{2}}}{3}xy\cdot\frac{1}{\underset{2}{\cancel{4}}}a^2x^2 = -\frac{1}{6}a^2x^3y$

(20) $-\frac{2}{3}xy\left(-\frac{1}{2}ax\right)^3 = -\frac{\overset{1}{\cancel{2}}}{3}xy\cdot\left(-\frac{1}{\underset{4}{\cancel{8}}}a^3x^3\right) = \frac{1}{12}a^3x^4y$

HI88a Simplifying Monomials and Polynomials 1

Time : to : Date Name

◆ Simplify.

(1) $(-x^3y)^2(-4xy)^3 = (x^6y^{\boxed{2}})(-64x^3y^{\boxed{3}})$

$= -64x^7y^{\boxed{5}}$

(2) $(-5a^2b^3)^2(-ac^2)^4 = (\boxed{25}a^4b^{\boxed{6}})(a^{\boxed{4}}c^{\boxed{8}})$

$= \boxed{25}a^{\boxed{8}}b^{\boxed{6}}c^{\boxed{8}}$

(3) $(-3xy^2)^2(-2x^3y)^3 = (\boxed{9}x^{\boxed{2}}y^{\boxed{4}})(\boxed{-8}x^{\boxed{9}}y^{\boxed{3}})$

$= -72x^{11}y^7$

(4) $\left(-\frac{1}{2}xy^2\right)^3(-4x^2y)^2 = \left(-\frac{1}{8}x^3y^6\right)\left(16x^4y^2\right)$

$= -2x^7y^8$

(5) $(-2a^2x)^3\left(-\frac{1}{2}bx\right)^3 = (-8a^6x^3)\left(-\frac{1}{8}b^3x^3\right) = a^6b^3x^6$

(6) $\left(-\frac{3}{4}xy^2\right)^3\left(-\frac{1}{3}x^2y\right)^2 = \left(-\frac{27}{64}x^3y^6\right)\left(\frac{1}{9}x^4y^2\right)$

$= \frac{-3}{64}x^7y^8$

HI88b

(7) $(-5x^2y^3)^2 = 25x^{\boxed{4}}y^{\boxed{6}}$

(8) $-5(x^2y^3)^2 = -5x^{\boxed{4}}y^{\boxed{6}}$

(9) $(-ab^2)^2 = a^2b^4$

(10) $-(ab^2)^2 = -a^2b^4$

(11) $(-2ab^2c)^4 = 16a^4b^8c^4$

(12) $-2(ab^2c)^4 = -2a^4b^8c^4$

(13) $-3(xy^2z^3)^3 = -3x^3y^6z^9$

(14) $(-3xy^2z^3)^3 = -27x^3y^6z^9$

H189

H189a Simplifying Monomials and Polynomials 1

Time : to : Date Name

◆ Simplify.

(1) $x^2 \cdot x^3 \cdot x^4 = x^9$

(2) $(2x^2)(3x^3)(4x^4) = 24x^9$

(3) $(-xy)(-2x^2y^2)(-3x^3y^3) = -6x^6y^6$

(4) $2ab \cdot \left(-\frac{3}{4}a^2b^3\right)(-8bc) = 12a^3b^4c$

(5) $(-ab^2c^3)\cdot(-11a^3b^2c)\cdot(-11) = -121a^4b^4c^4$

(6) $13 \times \frac{1}{169}x^3yz^2 \times 13xy^3z = x^4y^4z^3$

(7) $-\frac{5}{9}a^3xy \cdot \frac{6}{7}ax^3y^2 \cdot \frac{4}{5}a^2xy^3 = -\frac{8}{21}a^6x^5y^6$

H189b

(8) $(3a^3bc^2)^2 = 9a^6b^2c^4$

(9) $(-4xy^3z^4)^3 = -64x^3y^9z^{12}$

(10) $-4(xy^3z^4)^3 = -4x^3y^9z^{12}$

(11) $-3a^2b^3\left(-\frac{2}{3}bc^2\right)^3 = -3a^2b^3 \cdot \left(-\frac{8}{27}b^3c^6\right)$

$= \frac{8}{9}a^2b^6c^6$

(12) $3a^2b^3\left(-\frac{2}{3}bc^2\right)^2 = 3a^2b^3 \cdot \frac{4}{9}b^2c^4 = \frac{4}{3}a^2b^5c^4$

(13) $(-3a^3b^4)^3 \times \frac{2}{9}a^2b = -27a^9b^{12} \cdot \frac{2}{9}a^2b = -6a^{11}b^{13}$

(14) $\left(-\frac{1}{3}x^2y\right)^2\left(-\frac{3}{4}xy^2\right)^3 = \frac{1}{9}x^4y^2 \cdot \left(-\frac{27}{64}x^3y^6\right)$

$-\frac{3}{64}x^7y^8$

HI90a Simplifying Monomials and Polynomials 1

Time : to : Date Name

◆ Simplify.

(1) $(3xy^2z^3)^3 = 27x^3y^6z^9$

(2) $\left(-\frac{2}{3}ab^3c\right)^3 = -\frac{8}{27}a^3b^9c^3$

(3) $-3a^2x^3\left(-\frac{2}{3}bx^2\right)^2 = -3a^2x^3 \cdot \frac{4}{9}b^2x^4 = -\frac{4}{3}a^2b^2x^7$

(4) $-4x^2y(-2xy^3z)^3 = -4x^2y(-8x^3y^9z^3) = 32x^5y^{10}z^3$

(5) $[(-2a^2b^3)^3]^2 = [-8a^6b^9]^2 = 64a^{12}b^{18}$

(6) $5x^2(y^2z)^2 \times (-3xyz^2)^2$

$= 5x^2 \cdot y^4z^2 \cdot 9x^2y^2z^4$

$= 45x^4y^6z^6$

HI90b

(7) $-\frac{1}{2}ab \cdot \frac{1}{3}bc \cdot (-\frac{1}{2}ac) = ab^2c^2$

(8) $3a^3b^2c \cdot 5a^2b^3c^2 \cdot 2abc = 30a^6b^6c^4$

(9) $3x^3(-x^2yz^3)^3 = 3x^3(-x^6y^3z^9) = -3x^9y^3z^9$

(10) $(-ab^2)^2(-3ac^2)^3 = a^2b^4 \cdot (-27a^3c^6)$

$= -27a^5b^4c^6$

(11) $[(-2xy^3)^2]^3 = [4x^2y^6]^3 = 64x^6y^{18}$

(12) $5x^3 \cdot (-2yz)^2 \cdot x^2y = 5x^3 \cdot (4y^2z^2) \cdot x^2y$

$= 20x^5y^3z^2$

H191a Simplifying Monomials and Polynomials 2

Time : to : Date Name

◆ Simplify as shown in the examples.

Ex. $a^5 \div a^3 = \frac{a^5}{a^3} = \frac{aaaaa}{aaa} = a^2$

$a^3 \div a^5 = \frac{a^3}{a^5} = \frac{aaa}{aaaaa} = \frac{1}{a^2}$

(1) $a^7 \div a^4 = \frac{a^7}{a^4} = \frac{aaaaaaa}{aaaa} = a^{\boxed{3}}$

(2) $a^4 \div a^7 = \frac{aaaa}{aaaaaaa} = \frac{1}{a^3}$

(3) $a^6 \div a^3 = \frac{aaaaaa}{aaa} = a^3$

(4) $a^2 \div a^6 = \frac{aa}{aaaaaa} = \frac{1}{a^4}$

(5) $a^3 \times a^3 \div a^2 = \frac{a^3 \cdot a^3}{a^2} = \frac{a^6}{a^2} = a^4$

(6) $a \times a^4 \div a^7 = \frac{a \cdot a^4}{a^7} = \frac{a^5}{a^7} = \frac{1}{a^2}$

(7) $a^3 \times a^5 \div a^2 = \frac{a^3 \cdot a^5}{a^2} = \frac{a^8}{a^2} = a^6$

(8) $a^4 \div a^3 \times a^7 = \frac{a^4 \cdot a^7}{a^3} = \frac{a^{11}}{a^3} = a^8$

(9) $a^4 \div a^3 \times a^7 = \frac{a^4 \cdot a^7}{a^3} = \frac{a^{11}}{a^3} = a^8$

H191b

Ex. $x^3 \div x = \frac{x^3}{x} = x^2$ $x^3 \div x^5 = \frac{x^3}{x^5} = \frac{1}{x^2}$

(10) $3x \div x = \frac{3x}{x} = \boxed{3}$

(11) $-14a \div 7a = \frac{-14a}{7a} = -2$

(12) $x^7 \div x^3 = \frac{x^7}{x^3} = x^{\boxed{4}}$

(13) $x^5 \div x^7 = \frac{x^5}{x^7} = \frac{1}{x^2}$

(14) $16x^3 \div 8x = \frac{16x^3}{8x} = 2x^{\boxed{2}}$

(15) $15a^4 \div 3a^2 = \frac{15a^4}{3a^2} = 5a^2$

(16) $6m^6 \div 3m^3 = \frac{6m^6}{3m^3} = 2m^3$

(17) $(a^2)^3 \div a^3 = \frac{(a^2)^3}{a^3} = \frac{a^{\boxed{6}}}{a^3} = a^{\boxed{3}}$

(18) $(a^2)^3 \div a^7 = \frac{(a^2)^3}{a^7} = \frac{a^6}{a^7} = \frac{1}{a}$

(19) $(6m^2)^2 \div 12m^3 = \frac{(6m^2)^2}{12m^3} = \frac{36m^4}{12m^3} = 3m$

(20) $27xy^2 \div (3y)^2 = \frac{27xy^2}{(3y)^2} = \frac{27xy^2}{9y^2} = 3x$

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● Simplify as shown in the examples.

Ex. $12a^4b^3c \div 6a^2b^3 = \frac{12a^4b^3c}{6a^2b^3} = 2a^2c$

(1) $8a^4b^7c^3 \div 2a^4b^2c = \frac{8a^4b^7c^2}{2a^2b^2c} = \boxed{4}b^{\boxed{5}}\boxed{c}$

(2) $24a^6b^8c \div 6a^5b^2c = \frac{24a^6b^8c}{6a^5b^2c} = 4ab^6$

(3) $18a^6b^7c^4 \div 3a^2b^3c^4 = \frac{18a^6b^7c^4}{3a^2b^3c^4} = 6a^4b^4$

(4) $15a^5b^4c^3 \div 5a^3b^2c = \frac{15a^5b^4c^3}{5a^3b^2c} = 3a^2b^2c^2$

(5) $18a^3 \div (3a)^2 = \frac{18a^3}{9a^{\boxed{2}}} = 2a$

(6) $a^2b^3 \div (3ab)^2 = \frac{a^2b^3}{\boxed{9}a^{\boxed{2}}b^{\boxed{2}}} = \frac{1}{9}b$

(7) $12a^2x^5y^4 \div (3ax^2y)^2 = \frac{12a^2x^5y^4}{9a^2x^4y^2} = \frac{4}{3}xy^2$

H192b

Ex. $4a^3b \div 6ab^2 = \frac{4a^3b}{6ab^2} = \frac{2a^2}{3b}$

(8) $56x^2y^3 \div 24xyz^2 = \frac{56x^2y^3}{24xyz^2} = \frac{\boxed{7}xy^{\boxed{2}}}{3z^{\boxed{2}}}$

(9) $6a^7b^5c \div 4a^4b^3c^5 = \frac{6a^7b^5c}{4a^4b^3c^5} = \frac{3a^3b^2}{2c^4}$

(10) $\frac{8x^2y^4}{3} \div 2xy^4 = \frac{\overset{4}{\cancel{8}}x^2\cancel{y^4}}{3} \times \frac{1}{\underset{1}{\cancel{2}}\cancel{xy^4}} = \frac{\boxed{4}x}{3y^{\boxed{2}}}$

(11) $\frac{9x^3y}{2} \div 3xy^4 = \frac{\overset{3}{\cancel{9}}x^{\cancel{3}}\cancel{y}}{2} \cdot \frac{1}{\underset{1}{\cancel{3}}\cancel{xy^4}} = \frac{3x^2}{2y^3}$

(12) $\frac{4a^4b^5}{5} \div \frac{3a^2b^7}{10} = \frac{4a^4b^5}{\underset{1}{\cancel{5}}} \times \frac{\overset{2}{\cancel{10}}a^{\cancel{2}}}{3a^2b^7} = \frac{\boxed{8}a^{\boxed{2}}}{3b^{\boxed{2}}}$

(13) $\frac{4a^4b^5}{5} \div \frac{3}{10a^2b^7} = \frac{4a^4b^5}{\underset{1}{\cancel{5}}} \cdot \frac{\overset{2}{\cancel{10}}a^{\cancel{2}}b^7}{3} = \frac{8a^6b^{12}}{3}$

H193

H193a Simplifying Monomials and Polynomials 2

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◆ Simplify.

(1) $\left(\frac{2}{3}a^2b^3\right)^3 = \frac{8}{27}a^6b^9$

(2) $7a^3 \div 3a^4 = \frac{7a^3}{3a^4} = \frac{7}{3a^3}$

(3) $\frac{3}{4}a^4 \div 3a = \frac{\overset{1}{\cancel{3}a^4}}{4} \times \frac{1}{\underset{1}{\cancel{3}a}} = \boxed{\frac{1}{4}}a^{(3)}$

(4) $\frac{2}{3}a^2b^4 \div \frac{5}{6}ab^2 = \frac{2a^2b^4}{\underset{1}{\cancel{3}}} \times \frac{\overset{2}{\cancel{6}}}{\boxed{5ab^2}} = \frac{4ab^2}{5}$

(5) $\frac{3}{8}x^3y^3 \div (3xy^3)^2 = \frac{\overset{1}{\cancel{3}x^3y^3}}{8} \times \frac{1}{\underset{3}{\cancel{9}}\boxed{x^2y^{(3)}}} = \frac{x^5}{24y^3}$

(6) $(4xy^2z^3)^2 \div \frac{4}{3}x^2y^2z^4 = \overset{4}{16}x^2y^4z^6 \cdot \frac{3}{\underset{1}{\cancel{4}}x^2y^2z^4} = 12yz^2$

H193b

(7) $6x^2y \div (-3xy) = -\frac{6x^2y}{3xy} = -2x$

(First determine the sign.)

(8) $\frac{2}{3}ab^3 \div \left(-\frac{1}{6}ab\right) = -\frac{2ab^3}{\underset{1}{\cancel{3}}} \times \frac{\overset{2}{\cancel{6}}}{\boxed{ab}} = -4b^2$

(9) $\frac{3}{5}x^4y^5 \div \left(-\frac{3}{10}x^2y^7\right) = -\frac{\overset{1}{\cancel{3}}x^4y^5}{\underset{1}{\cancel{5}}} \cdot \frac{\overset{2}{\cancel{10}}}{\underset{1}{\cancel{3}}x^2y^7} = -\frac{2x^2}{y^2}$

(10) $\frac{2}{3}ab^3 \div \left(-\frac{1}{6}ab\right)^2$

$= \frac{2}{3}ab^3 \div \frac{1}{\boxed{36}}a^2b^{(2)} = \frac{2ab^3}{\underset{1}{\cancel{3}}} \times \frac{\overset{12}{\boxed{36}}}{a^2b^{(2)}} = \frac{24b}{a}$

(11) $-\frac{3}{8}a^7b^3 \div (-3ab^3)^3 = \frac{3a^7b^3}{8} \div 27a^3b^9$

$= \frac{\overset{1}{\cancel{3}a^7b^3}}{8} \cdot \frac{1}{\underset{9}{\cancel{27}a^3b^9}} = \frac{a^4}{72b^6}$

H194

H194a Simplifying Monomials and Polynomials 2

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✱ Simplify. First determine whether the answer is positive or negative.

(1) $-\frac{2}{3}x^2y^4 \div \frac{4}{9}x^3y^2 = -\frac{2x^2y^4}{3} \div \frac{4x^3y^2}{9}$

$= -\frac{\overset{1}{\cancel{2}}x^2y^4}{\underset{1}{\cancel{3}}} \cdot \frac{\overset{3}{\cancel{9}}}{\underset{2}{\cancel{4}}x^3y^2} = \frac{-3y^2}{2x}$

(2) $6x^2y \div (-3xy)^2 = 6x^2y \div 9x^2y^2$

$= \overset{2}{\cancel{6}}x^2y \cdot \frac{1}{\underset{3}{\cancel{9}}x^2y^2} = \frac{2}{3y}$

(3) $\left(\frac{3}{5}x^2y^5\right)^2 \div \left(-\frac{3}{10}x^2y^7\right)^2 = \frac{9x^8y^{10}}{25} \div \frac{9x^4y^{14}}{100}$

$= \frac{\overset{1}{\cancel{9}}x^8y^{10}}{\underset{1}{\cancel{25}}} \cdot \frac{\overset{4}{\cancel{100}}}{\underset{1}{\cancel{9}x^4y^{14}}}$

$= \frac{4x^4}{y^4}$

(4) $\frac{\frac{4}{5}a^4b^5}{-\frac{3}{10}a^2b^7} = -\frac{4a^4b^5}{\underset{1}{\cancel{5}}} \cdot \frac{\overset{2}{\cancel{10}}}{3a^2b^7} = -\frac{8a^2}{3b^2}$

H194b

(5) $\frac{2}{3}a^4b^4 \times (-3a^2b) \div \frac{1}{4}a^5b^7$

$= -\frac{2a^4b^4}{\underset{1}{\cancel{3}}} \times \overset{1}{\cancel{3}}a^2b \times \frac{4}{\boxed{a^5b^7}} = -\frac{\boxed{8}a}{b\boxed{3}}$

(6) $8x^3y \times \frac{3}{4}xy^4 \div \left(-\frac{3}{5}x^7y^2\right)$

$= -\overset{2}{\cancel{8}}x^3y \cdot \frac{\overset{1}{\cancel{3}}xy^4}{\underset{1}{\cancel{4}}} \cdot \frac{5}{\underset{1}{\cancel{3}}x^7y^2} = -\frac{10y^3}{x^4}$

(7) $-6a^4b^2 \div \left(-\frac{1}{2}a^2b^2\right) \times (-4a^3b^2)$

$= -6a^4b^2 \cdot \frac{2}{a^2b^2} \cdot 4a^3b^2 = -48a^5b^2$

(8) $\frac{3}{4}x^4y^2 \times \left(-\frac{1}{3}x^2y^4\right) \div (-12xy^2)$

$= \frac{\overset{1}{\cancel{3}}x^4y^2}{4} \cdot \frac{x^2y^4}{\underset{1}{\cancel{3}}} \cdot \frac{1}{12xy^2} = \frac{x^5y^4}{48}$

HI95a Simplifying Monomials and Polynomials 2

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◆ Simplify as shown in the examples.

Ex. $3(a+4b)=3a+12b$
$3a(a-4b)=3a^2-12ab$

Note Expressions such as $3a^2$ and $-12ab$, which involve only the multiplication of numbers and letters, are called *monomials* while those that express the sum of monomials are called *polynomials*.

(1) $2a(b+2c)=2ab+\boxed{4}ac$

(2) $3a(a-4b)=3a^{\boxed{2}}-12\boxed{ab}$

(3) $-3a(2a+5b)=-6a^2-\boxed{15ab}$

(4) $-2a(a-b-c)=\boxed{-2}a^2+2\boxed{ab}+\boxed{2ac}$

(5) $-3x(x-2y+5z)=-3x^2+6xy-15xz$

(6) $-3ab(a-2b)=-3a^{\boxed{2}}b+\boxed{6}ab^{\boxed{2}}$

(7) $4ab(2a-3b+4)=8a^2b-12ab^2+16ab$

(8) $-4xy(3x^2-xy+2y^2)=-12x^3y+4x^2y^2-8xy^3$

HI95b

(9) $(2b-5)\times(-3a)=-6ab+\boxed{15}a$

(10) $(a+2b-5)(-2b)=\boxed{-2}ab-\boxed{4}b^{\boxed{2}}+\boxed{10}b$

(11) $(3a+4b-2)\times(-5a)=-15a^2-20ab+10a$

(12) $\frac{5}{2}x(8x-4y)=20x^{\boxed{2}}-\boxed{10}xy$

(13) $\frac{1}{4}a(4a-12b+8)=a^2-3ab+2a$

(14) $-\frac{3}{4}x(-8xy-12y)=6x^2y+9xy$

(15) $24b\left(\frac{a}{2}-\frac{5b}{6}\right)=12ab-20b^2$

(16) $-12ab^2\left(\frac{2}{3}a^3-\frac{5}{6}b^3\right)=-8a^4b^2+10ab^5$

(17) $\frac{1}{3}x(6x-9y+12)=2x^2-3xy+4x$

H196

H196a Simplifying Monomials and Polynomials 2

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◆ Simplify as shown in the example.

Ex.
$$\begin{aligned} &2x(x+4)-3x(2x-5) \\ &=2x^2+8x-6x^2+15x \\ &=-4x^2+23x \end{aligned}$$

(1) $4x(x-3)-2x(x+5)$
$=4x^2-\boxed{12}x-\boxed{2}x^{\boxed{2}}-\boxed{10x}$
$=\boxed{2}x^2-\boxed{22}x$

(2) $2x(x+3)-3(2x-3)$
$=2x^2+6x-6x+9$
$=2x^2+9$

(3) $-2x(3y-x)-3x(5y-9x)$
$=-\boxed{6}xy+\boxed{2}x^2-15\boxed{xy}+\boxed{27x^2}$
$=29x^2-21xy$

(4) $-2y(x-y)-x(y+2x)$
$=-2xy+2y^2-xy-2x^2$
$=-2x^2-3xy+2y^2$

(5) $x^2(x^2+x+1)-x(x^2+x+1)$
$=x^4+x^3+x^2-x^3-x^2-x$
$=x^4-x$

H196b

(6) $a(a-b)+b(a-b)$
$=a^2-ab+\boxed{ab}-\boxed{b^2}$
$=a^2-b^2$

(7) $a(a-b)-b(a-b)$
$=a^2-ab-ab+b^2$
$=a^2-2ab+b^2$

(8) $a(b-c)+b(c-a)+c(a-b)$
$=ab-ac+bc-ab+ac-bc$
$=0$

(9) $2x(3x-2y)+3y(x-2y)-6(x^2-y^2)$
$=6x^2-4xy+3xy-6y^2-6x^2+6y^2$
$=-xy$

(10) $a(a^2-ab+b^2)+b(a^2-ab+b^2)$
$=a^3-a^2b+ab^2+a^2b-ab^2+b^3$
$=a^3+b^3$

(11) $\frac{1}{5}(5a-10b+2c)-10\left(\frac{1}{2}a-\frac{b}{5}+\frac{7}{50}c\right)$
$=a-2b+\frac{2}{5}c-5a+2b-\frac{7}{5}c$
$=-4a-c$

H197

H197a Simplifying Monomials and Polynomials 2

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◆ Simplify as shown in the example.

Ex. $\frac{1}{a}(3a^2-5a)=\frac{3a^2}{a}-\frac{5a}{a}=3a-5$

(1) $\frac{1}{x}(x^2-7x)=\frac{x^2}{x}-\frac{7x}{x}=x^2-\boxed{7}$

(2) $\frac{1}{2x}(6x^2-8x)=\frac{6x^2}{2x}-\frac{\boxed{8x}}{2x}=\boxed{3}x-\boxed{4}$

(3) $\frac{1}{4x}(8x^2-4x)=\frac{8x^2}{4x}-\frac{4x}{4x}=2x-1$

(4) $\frac{1}{3a}(6a^2-3a)=\frac{6a^2}{3a}-\frac{3a}{3a}=2a^2-1$

(5) $\frac{1}{2a}(8a^3-12a^2+6a)=\frac{8a^3}{2a}-\frac{12a^2}{2a}+\frac{\boxed{6a}}{2a}$

$=4a^2-6a+3$

(6) $\frac{1}{2x}(4x^3-8x^2+2x)=\frac{4x^3}{2x}-\frac{8x^2}{2x}+\frac{2x}{2x}$

$=2x^2-4x+1$

H197b

(7) $-\frac{1}{2a}(6a^2+4a)=-\frac{6a^2}{2a}-\frac{4a}{2a}=-3a-2$

(8) $-\frac{1}{2x^2}(6x^3+3x^2)=\frac{-6x^3}{2x^2}-\frac{3x^2}{2x^2}=-3x-\frac{3}{2}$

(9) $-\frac{1}{5x}(10xy-15x^2)=\frac{-10xy}{5x}+\frac{15x^2}{5x}=-2y+3x$

(10) $\frac{1}{3ab}(9a^2b-15ab)=\frac{9a^2b}{3ab}-\frac{15ab}{3ab}=3a-5$

(11) $\frac{1}{2xy}(4x^2y-6xy^2)=\frac{4x^2y}{2xy}-\frac{6xy^2}{2xy}=2x-3y$

(12) $\frac{1}{5ab}(5ab-10a^2b^3)=\frac{5ab}{5ab}-\frac{10a^2b^3}{5ab}=1-2ab^2$

(13) $\frac{1}{2}(4x^2-6x+3)=2x^2-3x+\frac{3}{2}$

(14) $\frac{1}{2a}(6a^3+4a^2-3a)=3a^2+2a-\frac{3}{2}$

H198a Simplifying Monomials and Polynomials 2

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◆ Simplify as shows in the examples.

Ex. $\dfrac{5a^2-ab}{a}=\dfrac{5a^2}{a}-\dfrac{ab}{a}=5a-b$

(1) $\dfrac{a^2+ab}{a}=\dfrac{a^2}{a}+\dfrac{ab}{a}=\boxed{a}+\boxed{b}$

(2) $\dfrac{a^2-2a}{a}=\dfrac{a^2}{a}-\dfrac{2a}{a}=a-2$

(3) $\dfrac{a^2+a}{a}=\dfrac{a^2}{a}+\dfrac{a}{a}=a+1$

(4) $\dfrac{5x^2-x}{x}=\dfrac{5x^2}{x}-\dfrac{x}{x}=5x-1$

(5) $\dfrac{ab^2-abc+ab}{ab}=\dfrac{ab^2}{ab}-\dfrac{abc}{ab}+\dfrac{ab}{ab}=b-c+1$

(6) $\dfrac{6x^3-2x^2+2x}{2x}=\dfrac{6x^3}{2x}-\dfrac{2x^2}{2x}+\dfrac{2x}{2x}=3x^2-x+1$

(7) $\dfrac{-9x^2y+3xy^2}{3xy}=\dfrac{-9x^2y}{3xy}+\dfrac{3xy^2}{3xy}=-3x+y$

H198b

Ex. $\dfrac{2x+y}{x}=\dfrac{2x}{x}+\dfrac{y}{x}=2+\dfrac{y}{x}$

(8) $\dfrac{a+b}{a}=\dfrac{a}{a}+\dfrac{\boxed{b}}{a}=\boxed{1}+\dfrac{\boxed{b}}{a}$

(9) $\dfrac{3x^2-y}{x}=\dfrac{3x^2}{x}-\dfrac{y}{x}=3x-\dfrac{y}{x}$

(10) $\dfrac{a^2+2a+b}{a}=\dfrac{a^2}{a}+\dfrac{2a}{a}+\dfrac{b}{a}=a+2+\dfrac{b}{a}$

(11) $\dfrac{a^2+a+1}{a}=\dfrac{a^2}{a}+\dfrac{a}{a}+\dfrac{1}{a}=a+1+\dfrac{1}{a}$

(12) $\dfrac{a^3-a^2+a}{a}=\dfrac{a^3}{a}-\dfrac{a^2}{a}+\dfrac{a}{a}=a^2-a+1$

(13) $\dfrac{-3x^2-9x}{3x}=\dfrac{-3x^2}{3x}-\dfrac{9x}{3x}=-x-3$

(14) $\dfrac{1}{2a}(8a^2-6a)=\dfrac{8a^2}{2a}-\dfrac{6a}{2a}=4a-3$

(15) $\dfrac{1}{b}(b^2-2ab+b)=\dfrac{b^2}{b}-\dfrac{2ab}{b}+\dfrac{b}{b}=b-2a+1$

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◆ Simplify as shown in the example.

Ex. $\dfrac{ax^2+ax-a}{-a}=\dfrac{ax^2}{-a}+\dfrac{ax}{-a}-\dfrac{a}{-a}=-x^2-x+1$

(1) $\dfrac{a^2b-ab+2b}{-b}=\dfrac{a^2b}{-b}-\dfrac{ab}{-b}+\dfrac{2b}{-b}=-a^2+a-2$

(2) $\dfrac{6a^2-12ab+9ab^2}{-6a}=\dfrac{6a^2}{-6a}-\dfrac{12ab}{-6a}+\dfrac{9ab^2}{-6a}=-a+2b-\dfrac{3b^2}{2}$

(3) $\dfrac{-4a^2+5ab}{2a}=\dfrac{-4a^2}{2a}+\dfrac{5ab}{2a}=-2a+\dfrac{5b}{2}$

(4) $\dfrac{-15ax+9a^4x^3}{-3ax}=\dfrac{-15ax}{-3ax}+\dfrac{9a^4x^3}{-3ax}=5-3a^3x^2$

(5) $\dfrac{18x^3y-12xy^2+6xy}{3xy}=\dfrac{18x^3y}{3xy}-\dfrac{12xy^2}{3xy}+\dfrac{6xy}{3xy}$

$=6x-4y+2$

(6) $\dfrac{-10x^2y+6x^3y^2-2xy}{-2xy}=\dfrac{-10x^2y}{-2xy}+\dfrac{6x^3y^2}{-2xy}-\dfrac{2xy}{-2xy}$

$=5x-3xy+1$

H199b

(7) $(a^2b+ab^2)\div ab=\dfrac{a^2b}{ab}+\dfrac{ab^2}{ab}=a+b$

(8) $(8a^2-6a)\div 2a=\dfrac{8a^2}{2a}-\dfrac{6a}{2a}=4a-3$

(9) $(9ax-6ay)\div(-3a)=\dfrac{9ax}{-3a}-\dfrac{6ay}{-3a}=-3x+2y$

(10) $(a^2b-3ab+2b)\div(-b)=\dfrac{a^2b}{-b}-\dfrac{3ab}{-b}+\dfrac{2b}{-b}$

$=-a^2+3a-2$

(11) $(15x^5-5x^2)\div(-5x^2)=\dfrac{15x^5}{-5x^2}-\dfrac{5x^2}{-5x^2}=-3x^3+1$

(12) $(-8x^3y^3+16x^2y^3)\div(-4x^2y^2)=\dfrac{-8x^3y^3}{-4x^2y^2}+\dfrac{16x^2y^3}{-4x^2y^2}$

$=2xy-4y$

H200

H200a Simplifying Monomials and Polynomials 2

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● Simplify.

(1) $(-\frac{1}{2}a^2b)(\frac{3}{8}ab^2c^3)\left(-\frac{3a^2}{x}\right)$

$= 9a^5b^3c^3$

(2) $(-2x^3)(8x^2y)\left(-\frac{1}{2}xy^2\right)^3$

$= 2x^3 \cdot 8x^3y \cdot \frac{x^3y^6}{8} = 2x^8y^7$

(3) $6a^2b^3c \div (-8a^4b^3c^5)$

$= -\frac{3}{8}a^2b^3c \cdot \frac{1}{8a^4b^3c^5} = -\frac{3a^2b^2}{4c^4}$

(4) $\frac{16}{81}x^4y^4 \div \frac{8}{9}xy^3$

$= \frac{16x^4y^4}{81} \cdot \frac{9}{8xy^3} = \frac{2x^3}{9y}$

(5) $9y^2z^3\left(\frac{1}{6}x^2y - \frac{5}{9}xz^2\right)$

$= \frac{3}{2}x^2y^3z^3 - 5xy^2z^5$

H200b

(6) $\frac{2}{3}a^4b^4 \times (-3a^2b) \div \frac{1}{2}a^3b^3$

$= -\frac{2a^4b^4}{3} \cdot 3a^2b \cdot \frac{2}{a^3b^3} = -\frac{4a}{b^2}$

(7) $\frac{1}{2x}(6x^3 - 8x^2 + 2x)$

$= \frac{6x^3}{2x} - \frac{8x^2}{2x} + \frac{2x}{2x} = 3x^2 - 4x + 1$

(8) $(3ab - 2a^2b) \div \frac{1}{2a}$

$= (3ab - 2a^2b) \cdot 2a$

$= 6a^2b - 4a^3b$

(9) $2x(x^2 + 2x + 4) - 4(x^2 + 2x + 4)$

$= 2x^3 + 4x^2 + 8x - 4x^2 - 8x - 16$

$= 2x^3 - 16$

(10) $a^2b^2c \div abc - 6(ab - 5) - a^2b^2 \times \frac{1}{ab}$

$= a^2b^2c \cdot \frac{1}{abc} - 6ab + 30 - a^2b^2 \cdot \frac{1}{ab}$

$= ab - 6ab + 30 - ab = -6ab + 30$